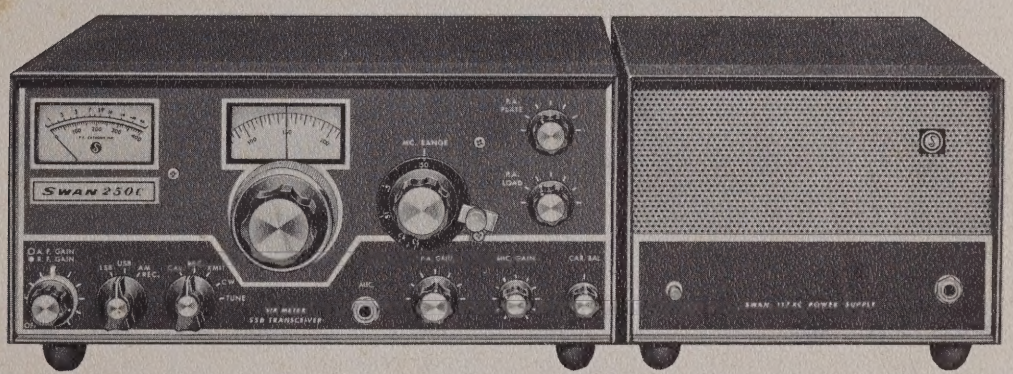
OPERATION AND MAINTENANCE

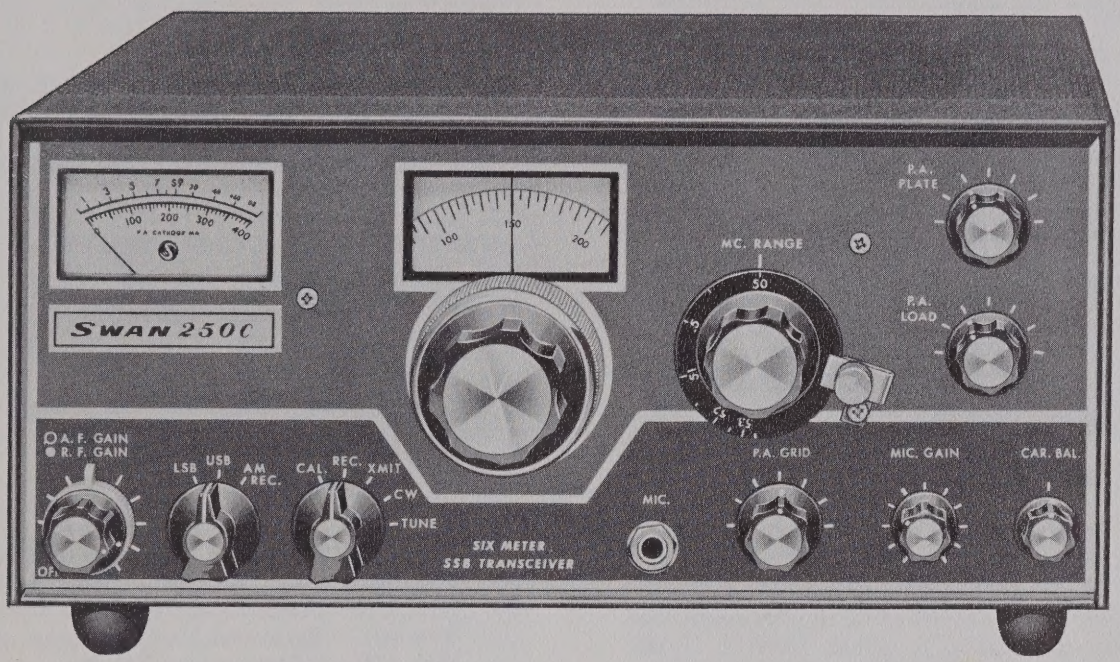


SWAN MODEL 250C

SIX METER SSB TRANSCEIVER

SWAN
ELECTRONICS
Oceanside, California
A Subsidiary of Cubic Corporation

OPERATION and MAINTENANCE
MODEL 250C 6 METER
Single Sideband Transceiver



INTRODUCTION

The Swan Model 250C Single Sideband Transceiver together with its accessories and optional equipment is designed to be used for SSB AM or CW communications in the 50-54 mc. amateur radio bands. MARS frequencies may also be covered by using the Model 510X oscillator accessory.

The Model 250C generates a single sideband signal by means of a crystal lattice filter, and the transceive operation automatically tunes the transmitter to the received frequency. Provisions are included in the transceiver for operation on either upper or lower sideband, and also for reception of AM signals.

Basic circuitry of the single conversion design has been proven in several thousands of the popular Swan transceivers. Mechanical, electrical, and thermal stability is exceptionally high. All oscillators are temperature compensated and voltage regulated. A 250 kc crystal calibrator for checking dial calibration is also included. Push-to-talk operation is standard, with provisions for plugging in the Model VX-2 accessory Vox unit for automatic voice control. Other accessories which may be added include the Model 210 External VFO, and the Model NS-1 Noise Silencer. These accessories plug directly into sockets provided for them on back of the 250C.

With a suitable power supply, operation may be fixed, portable, or mobile. Power input is rated at 240 watts, PEP, on single sideband, 180 watts on CW, and 75 watts on AM. The basic transceiver includes automatic gain control (AGC), and grid block CW keying.

Recommended power supplies are the model 117-XC for ac operation and model 14-117 for 12-volt dc operation.

SPECIFICATIONS:

FREQUENCY RANGE

50-54 mc.

POWER INPUT

Single Sideband, Suppressed Carrier:
240 watts, PEP.
180 watts, CW input.
75 watts, AM input.

DISTORTION

Distortion products down approx. 30 db.

UNWANTED SIDEBAND SUPPRESSION

Unwanted sideband down more than 40 db.

CARRIER SUPPRESSION

Carrier suppression greater than 50 db.

RECEIVER SENSITIVITY

Less than 0.5 microvolt at 50 ohms impedance for signal-plus-noise to noise ratio of 10 db. Noise figure better than 3 db.

AUDIO OUTPUT AND RESPONSE

Audio output, 4 watts to 3.2 ohm load. Response essentially flat from 300 to 3000 cps in both receive and transmit.

TRANSMITTER OUTPUT

Wide-range Pi-network output matches antennas essentially resistive from 15 to 500 ohms impedance.

METERING

Power amplifier cathode current 0-400 ma. on transmit. S- Meter 0-70 db over S9 on receive. Relative output in Tune mode.

FRONT PANEL CONTROLS.

CAL-REC-TRANS-CW-TUNE. AF-RF Gain. Mic. Gain. Carrier Balance. PA Plate Tune. PA Grid Tune. PA Load. KC Tuning Dial. MC Tuning Dial. LSB-USB-AM REC.

REAR PANEL CONTROLS AND CONNECTORS

Bias Adjust. CW key jack. Jones plug power connector. Vox connector. Antenna jack. S-Meter zero. Auxiliary relay switching. Outboard VFO connector. Noise blanker connectors.

VACUUM TUBE COMPLEMENT

V1 6EW6 VFO Amplifier
V2 12BE6 Transmitter Mixer
V3 6GK6 Driver
V4 6146B Power Amplifier
V5 6146B Power Amplifier
V6 6CW4 First RF Amplifier
V7 6CW4 Second RF Amplifier
V8 6HA5 Receiver Mixer
V9 6EW6 First IF Amplifier
V10 12BA6 Second IF Amplifier
V11 12AX7 Product Detector/Receive Audio
V12 6BN8 AGC Amplifier/Rectifier
V13 6GK6 Audio Amplifier
V14 6JH8 Balanced Modulator
V15 12BA6 Carrier Oscillator
V16 12AX7 Mic. Amplifier/Transmit Audio
V17 OA2 Voltage Regulator
V18 12BA6 250KC Calibrator

DIODE AND TRANSISTOR COMPLEMENT

Q1 2N706 Oscillator
Q2 2N706 Emitter Follower
Q3 2N706 Buffer Amplifier
D1701 1N2974A Zener voltage regulator
D1901 Relay Silencing Diode
D1902 AGC Charging bypass
D401 1N34A Relative Output Diode

POWER REQUIREMENTS

Filaments	12.6 volts, 4.5 amps, ac or dc
Relay	12 volts dc, 250 ma.
Bias	—110 volts dc, 100 ma.
Medium voltage	275 volts dc, 150 ma.
High voltage	800 volts dc, 300 ma. Peak Trans.

DIMENSIONS AND WEIGHT

Height	5½ in.	Depth	11 in.
Width	13 in.	Weight	17¼ lb.

A. CIRCUIT THEORY

GENERAL DISCUSSION

The Swan 250C transceiver provides single sideband, suppressed carrier transceiver operation, and generates the single sideband signal by means of a crystal lattice filter. To permit a logical discussion of this mode of operation, certain definitions are necessary. In a normal AM signal (double sideband with carrier), a radio frequency signal is modulated with an audio frequency signal. This is considered by many to be merely a case of varying the amplitude of the carrier at an audio rate. In fact, however, there are actually sideband frequencies generated, which are the results of mixing the RF and the AF signals. These sidebands are the sum of, and the difference between the two heterodyned signals. In the detection of this conventional AM signal, the two sidebands are mixed with the carrier to recover and reproduce the audio intelligence. This is an inefficient means of transmission, because only 25 percent of the transmitted power is used to transmit intelligence. There are other attendant drawbacks, also. The bandwidth of AM voice transmission is approximately 6 kc, while the actual demodulated audio is only approximately 3 kc. The result is inefficient use of the frequency band, and over half of the alloted band is unusable due to heterodynes, interference, and congestion.

In the single sideband, suppressed carrier mode of transmission, only one of the sideband signals is transmitted. The other sideband and the carrier are suppressed to negligible level. In addition to increasing the transmission efficiency by a factor of four, single sideband effectively doubles the number of stations or channels which can be used in a given band of frequencies.

It should be remembered that in the single sideband, suppressed carrier mode of transmitting, the unwanted sideband and carrier are only suppressed, not entirely eliminated. Thus, with a transmitted signal from a transmtiter with 40 db. sideband suppression, the other or unwanted sideband will be present, and will be transmitted, but its level will be 40 db below the wanted sideband. When this signal is received at a level of 20 db over S9, the unwanted sideband will be present at a level of approximately S5. The same is true of carrier suppression. With carrier suppression of 50 db, and a signal level of 20 db over S9, carrier will be present at a level of approximately S3 to S4.

In the Model 250C transceiver, the single sideband suppressed carrier signal is generated by the crystal lattice filter method. For details, refer to the schematic diagram and to Figures 1, 2, and 3.

SIGNAL GENERATION

When the push-to-talk switch on the microphone is pressed, the transmitter portion of the transceiver is activated, and it generates a single sideband, suppressed carrier signal in the following manner. Carrier is generated by V15 Carrier Oscillator, which is a Pierce oscillator with the crystal operating in parallel resonance. This stage operates in both the transmit and receive modes. When transmitting, the RF output of the oscillator is injected into the control grid of the balanced Modulator, V14. This balanced modulator is a beam deflection tube, and operates similar to a cathode ray tube in that the electron beam from the cathode is deflected to one output plate or the other by the charge appearing on the deflection plates. The carrier signal fed to the control grid of the balanced modulator appears on both plates of the output. The two plates are connected to Transformer Z1401 in push-pull, so the carrier signal cancels itself out in Z1401. The deflection plate DC voltages are adjusted by means of the carrier balance control so that the RF being fed to the output plates will cancel out, and the output from Z1401 will be zero. Audio signals from the Microphone Amplifier, V16, are applied as a modulating voltage to one deflection plate, and the two sidebands resulting from the carrier signals appear in the output of transformer Z1401. Carrier suppression is approximately 50 db.

The double sideband, suppressed carrier signal is then coupled from the secondary winding of Z1401 to the crystal filter, which suppressed the lower sideband, and permits only the upper sideband to be fed to the First IF Amplifier, V. The carrier frequency is generated at approximately 10,898 kc.

The crystal filter is designed with a passband extending from 10,898.3 to 10,901.1 kc at the 6 db points. Thus, only audio modulation from 300 to 3100 cycles is passed by the filter.

Q1, the VFO 2N706 Oscillator, operates in the common base configuration as a Colpitts oscillator. Q2, the Emitter Follower is used for isolation and impedance matching purposes. The extremely good regulation achieved through using the Zener diode regulator D1701 across the bias supply voltage, also contributes to the stability. Q3 is a Buffer Amplifier stage which provides further isolation. The VFO in the Model 250C exhibits good stability after the initial warm-up period. Drift from a cold start will be approximately 2 kc for the first hour. After the initial warm-up period, drift will be negligible.

The single sideband, suppressed carrier signal from the First IF Amplifier is fed to the Transmitter Mixer, V2, where it is heterodyned with the VFO signal. The resultant signal at the desired transmit frequency is amplified by the Driver, V3, and the Power Amplifiers, V4 and V5. The signal from the VFO Amplifier is initiated in the transistorized VFO-Emitter Follower circuit Q1, Q2, and Q3. The signal from the VFO is routed to the VFO Amplifier.

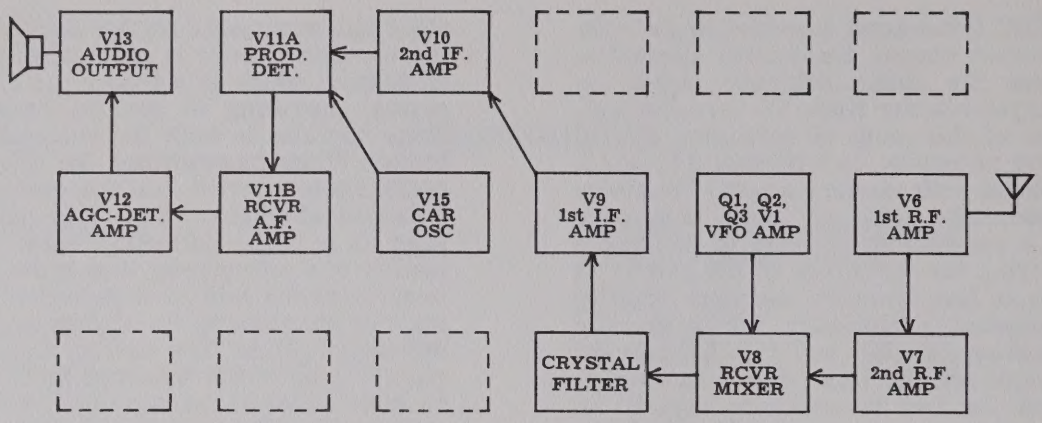


FIGURE 1 BLOCK DIAGRAM, RECEIVE MODE

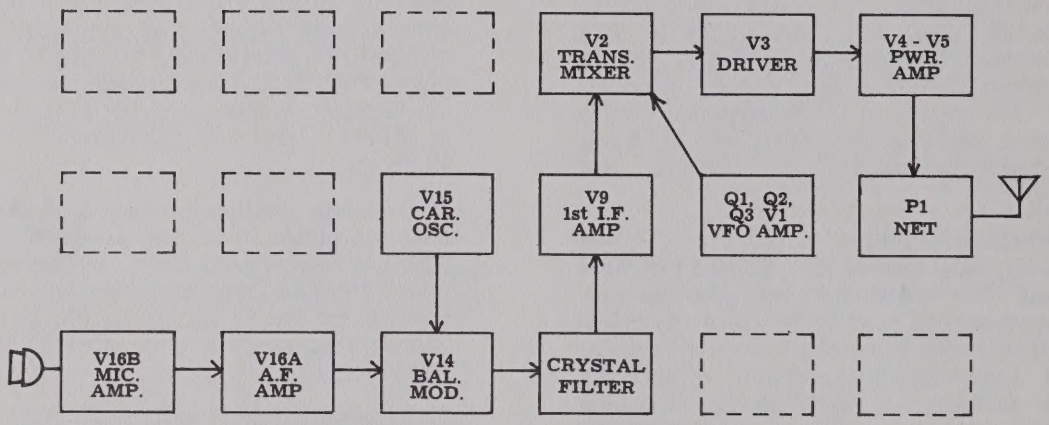


FIGURE 2 BLOCK DIAGRAM, TRANSMIT MODE

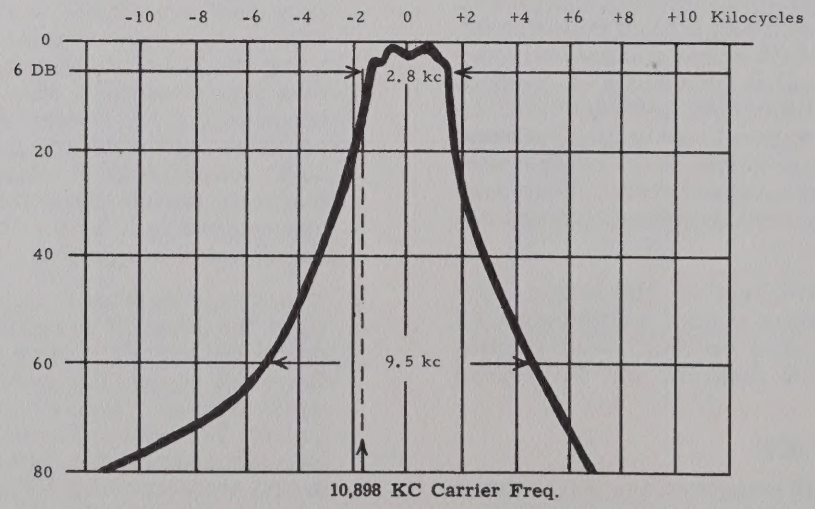


FIGURE 3 CRYSTAL FILTER, TYPICAL CHARACTERISTIC

A. Circuit Theory (cont.)

TUNE AND CW OPERATION

Normally, the frequency of the carrier oscillator is approximately 300 cps outside the 6 db passband of the crystal lattice filter. In TUNE position, to enable the transmitter to be tuned to the maximum power output condition, the fequency of the carrier oscillator is moved approximately 800 cps to place it well within the passband of the crystal lattice filter. At the same time, one deflection plate of the balanced modulator is grounded, unbalancing the modulator and allowing full carrier input for tuning purposes. A similar procedure is followed for CW to allow full carrier output during CW operation. During CW operation, the cathode V16A is disconnected from ground. This allows CW operation with no accidental audio modulation from the microphone.

RECEIVE

In RECEIVE position, or at any time when the transmitter is not in TRANSMIT, all circuits used in transmitting are disabled through the relay controlled circuits, K1, K2. The relays are energized for transmitting and de-energized for receiving. Relay K2, when de-energized, connects the antenna to the receiver input coil, L602, and to the First Receiver RF Amplifier, V6. L601 is a 58 mc. trap for TV "birdies" from Channel 2 and L604 is a 28 mc. trap. The interstage coils, L701-702 couple the Second Receiver RF Amplifier, V7, to the control grid of the Receiver Mixer, V8. The local oscillator signal from the VFO Amplifier is now used to heterodyne the received signal to the IF frequency. All IF amplification is accomplished at this frequency, nominally 10.9 mc., through V9 and V10 IF amplifiers. In the Product Detector V11A, the IF signal is heterodyned with the carrier frequency generated by the Carrier Oscillator, V15. The resultant audio signal is then amplified by V11B, which then couples to V12, the AGC amplifier, and V13, the output audio stage.

FREQUENCY CALIBRATION

Frequency calibration of the Model 250C is in 5 kc increments on the 0-500 kc vernier tuning dial. Accuracy of this dial reading depends directly on the setting of the Megacycle Dial. When it is set to minimum frequency, (maximum tuning capacity), it will be at the 50 mc mark, and zero on the vernier dial will be 50 mc. Tuning the vernier dial will then change the frequency from 50 to 50.5 mc. Other .5 mc segments, (500 kc), are covered by turning the Megacycle Dial up in frequency in .5 mc steps.

Dial accuracy and tracking are quite good on the 250C, but caution must always be observed when operating near band edges. The 250kc crystal calibrator built into the 250C is useful for this purpose. However, its frequency should be checked from time to time against WWV or some other known standard.

TRANSMIT AND RECEIVE SWITCHING

Transmit and receive switching is performed by relays K1 and K2. In TRANSMIT position, only those tubes that operate in the transmit mode are operative, all others being biased to cutoff through the relay contacts. In the RECEIVE position, with the relays de-energized, the tubes that are used only in transmit are cut off in the same manner. Relay K2 when de-energized, feeds signals from the antenna to the receiver, and is used also to control external switching circuits.

POWER RATING

The Swan 250C is capable of 240 watts, PEP input under steady state two-tone test conditions, when operated with any of the recommended power supplies. The peak envelope power, when voice modulated, is somewhat greater, typically 280 watts, or more.

Recommended power supplies produce a no-load plate voltage of approximately 925 volts. Under TUNE conditions, or CW operation, this voltage will drop to approximately 740 volts. Under steady state two-tone modulation, the voltage will drop to approximately 770 volts. If the power amplifier idling current is 40 ma, and the two-tone current, just before flat-topping, is 220 ma., the peak two-tone current will be 320 ma. Under these conditions the PEP input will be 770 volts time 320 ma, = 240 watts. Under voice modulation, because average power is considerably less, the power amplifier plate and screen voltages will be maintained higher, even during voice peaks, by the power supply filter capacities. Peak plate current will therefore also be higher than with two-tone test conditions. Readings of cathode current will not reflect this power input, however, because of the damping in the cathode current meter. Cathode current readings under normal voice input should not exceed approximately 125 ma.

B. INSTALLATION

GENERAL

The Swan 250C transceiver has been designed to provide the utmost in ease of operation, stability, versatility, and enjoyment. Maximum enjoyment from your Swan will depend to a great extent on the installation. For fixed station or portable use, operation with the Model 117-XC power supply provides a compact arrangement with maximum ease of operation. All switching is performed in the transceiver. For mobile installations, the Model 14-117 supply provides similar switching arrangements, and speaker output may be fed through the car broadcast receiver speaker.

POWER SUPPLY

The Swan Models 117-XC or 230-XC Power Supplies provide all necessary voltages required by the transceiver for AC operation. The supplies come equipped with a pre-wired plug and cable, all ready for plugging into the transceiver. The Model 14-117 supply for mobile operation includes all necessary cables, connector plug, fuses, and installation hardware. The Jones plug for connection to the transceiver is furnished with the unit.

Power requirements for the Swan 250C are listed in the following table. Pin connections to the Jones type power connector are listed as an aid in connecting other brands or home-brew supplies.

EXTERNAL CONNECTIONS

Audio output from the transceiver is provided at pin 12 of the Jones plug. The other speaker lead goes to the common chassis ground at pin 6. Output impedance is between 3 and 4 ohms. For mobile installations, the car broadcast speaker may be used, in which case a DPDT selector switch should be installed to select the broadcast receiver or transceiver output. (See Page 17.)

EXTERNAL SWITCHING

On the rear of the 250C chassis is a three lug terminal connection for external switching. These connections are marked "R" (receive), "C" (common), and "T" (transmit). When in the receive position the "R" and "C" terminals are connected and in transit the "T" and "C" terminals are connected. These connections are made through relay K2 and are used for switching an antenna relay, a final amplifier, etc.

JONES PLUG CONNECTIONS

	Pin	Nominal	Minimum	Maximum
High Voltage	8	800 VDC 300 MA	600 VDC Low Pwr.	900 VDC Hi. Power
Medium Voltage	10	275 VDC 150 MA	225 VDC	325 VDC
Bias Voltage	3	-110 VDC 100 MA	-100 VDC	-130 VDC
Filament Voltage	4	12.6V* 4.5 amp	11.5V	14.5 V
Relay Voltage	5	12 VDC 250 MA	10 VDC	14.5 VDC
*AC or DC				

MICROPHONE

The microphone input is designed for high impedance microphones only. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transceiver provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat response throughout the speech range. The microphone plug must be a standard ¼ in. diameter three-contact type. The tip connection is for push-to-talk relay control, the ring connector is the microphone terminal, and the sleeve is the common chassis ground. The microphone manufacturer's instructions should be followed in connecting the microphone cable to the plug. With many microphones, the push-to-talk button must be pressed to make the microphone operative. For VOX operation, this feature may be disabled, if desired by opening the microphone case and permanently connecting the contacts which control the microphone.

ANTENNA

Any of the common antenna systems designed for use in the 6 meter amateur band may be used with the Swan transceiver, provided the input impedance of the transmission line is not outside the capability of the pi-output matching network. The transmission line should be of the coaxial cable type. An antenna system should show a standing wave ratio of less than 2:1 when using 50 or 75 ohm coaxial transmission line. If open-wire or balanced type transmission line is used with the antenna, a suitable antenna tuner is recommended between the transceiver and the feedline. Various types of antennas are available from your dealer, and for the antenna builder, many are described in the amateur handbooks, also available from your dealer. Remember that even the most powerful transmitter is useless without a proper and efficient antenna system.

C. OPERATION

Before connecting any cables to the Swan 250C perform the following steps:

1. Rotate the PA BIAS control on the rear chassis apron, fully counter clockwise.
2. Rotate the CAL - REC - XMIT - CW - TUNE SWITCH on the lower left of the front panel to REC.
3. Rotate the RF GAIN Control counter clockwise to operate the power switch to OFF.

POWER SUPPLY AND ANTENNA CONNECTIONS

1. Connect the 50 to 75 ohm antenna feedline to the coaxial connector on the rear chassis panel.
2. Connect the power supply cable to the Jones connector on the rear chassis apron.
3. Connect the power supply to the proper voltage source.

WARNING

DANGEROUS HIGH VOLTAGE IS PRESENT ON THE PLATE OF THE POWER AMPLIFIER WHENEVER THE POWER SUPPLY IS ENERGIZED. NEVER TURN POWER ON WHEN THE POWER AMPLIFIER COVER IS REMOVED. HIGH VOLTAGE IS ALSO PRESENT AT PIN EIGHT OF THE POWER PLUG.

CONTROL FUNCTIONS

ON-OFF SWITCH (On AF & RF Gain Knob) — Turns power supply on and off.

CAL-REC-XMIT-CW-TUNE

Calibrate	All voltages are applied to Transceiver. Grounds cathode of V18. Removes ground from cathode of V15A.
Receive	All voltages are applied to transceiver.
Xmit	12 volt dc circuit through relay K1 and K2 is completed, and tubes used only in receive are biased to cutoff.
cw	All circuits for transmit are energized, as above. Capacitator C1503 in the carrier oscillator is removed from ground. Carrier must be inserted with CAR. BAL. control.
Tune	Same as CW except that carrier is fully inserted, and meter reads relative output.
Mic. Gain	Controls potentiometer R-1603 in the grid of V16A and controls amount of audio to the balanced modulator.
CAR. BALANCE	Controls potentiometer R-1410 in the balanced modulator deflection plate circuit, and pemits nulling out the carrier.
RF GAIN	Controls variable resistor R1912, common in the grids of receiver mixer V8, RF Amplifier, V9 and V10 IF Amplifiers.
AF GAIN	Controls potentiometer R-1301 in grid circuit of V13 AF Output, and controls audio volume.
FUNCTION SWITCH	Changes transceiver from USB to LSB or AM Mode.
VERNIER KC TUNING	Controls C2010 in frequency determining tank circuit of VFO.
VERNIER MC TUNING	Controls C2015 in VFO.
PA GRID	Controls C105 in plate tanks of transmitter mixer and driver.
PA TUNE	Controls C405 on pi-network to tune final power amplifier plate to resonance.
PA LOAD	Controls C404 in pi-network to match impedance of output load.

RECEIVE OPERATION

1. Rotate the RF GAIN Control clockwise to full clockwise position. The power switch will operate applying filament, relay, bias, medium, and 800 volt high voltage to the transceiver.
2. Wait approximately one minute to allow the tube filaments to reach operating temperature. During this period, perform the following steps:
   (a) Rotate MIC. GAIN fully counter-clockwise.
   (b) Rotate CAR. BAL. control to the mid-scale position, with white dot on knob aligned with the long index mark on the panel
   (c) Preset PA PLATE control to 10 o'clock position.
   (d) Preset PA GRID control to 10 o'clock position.
   (e) Preset PA LOAD to mid-position.
   (f) Set tuning dial to desired operating frequency.
   (g) Set AF GAIN control to approximately 12 o'clock position.
   (h) Set receiver function switch to either LSB, USB or AM, whichever mode is desired.
3. Adjust the PA GRID control for maximum receiver noise. Then tune across the band for signals.
4. The main tuning knob is labeled MC. Range. To tune the lower 500 KC of the 6 meter band, set this control to the 50 mc index mark. To tune higher in the band, the main tuning control must be advanced .5 mc (500 KC) at a time.

5. The 250 KC calibrator will prove useful in setting the main tuning dial to an exact 250 KC multiple.

NOISE SILENCER

On the rear of the 250C chassis are three phono-jacks for the SWAN NOISE SILENCER. These jacks are marked IN, -10V, and OUT. For installation instructions see page 25.

RECEIVER TUNING—IMPORTANT, READ CAREFULLY.

Precise tuning of a single sideband signal is very important. Do not be satisfied to merely tune until the voice can be understood, but take the extra care of setting the dial to the exact spot where the voice sounds natural. Above all, avoid the habit of tuning so that the voice is pitched higher than normal. This is an unfortunate habit practiced by quite a number of operators. The following points help to explain the effects of mistuning:

1. If you tune so the received voice is higher than normal pitch, you will then transmit off frequency, and your voice will sound lower than normal pitch to the other station. He will probably retune his dial to make you sound right. If you keep this up, you'll gradually waltz one another across the band. If both of you are mistuning to an unnatural higher pitch, you'll waltz across the band twice as fast. (And someone will no doubt be accused of frequency drift.)

2. Mistuning results in serious harmonic distortion on the voice, and should be quite noticeable to the average ear. Some will claim that if they don't know how the other person's voice actually sounds, they can't tune him in properly, but this is not true. With a little practice, it will be fairly easy to tell. Some voices are relatively rich in harmonics, and are easier to tune in than a person with a "flat" voice. Also, a transmitter which is being operated properly with low distortion will be easier to tune in than one which is being overdriven and is generating excessive distortion. There is no mistaking when you have a station tuned right on the nose.

3. A vernier control for receive frequency, sometimes referred to as "incremental tuning," is not available on the Swan 250C. Such a device is not necessary if proper tuning habits are exercised.

4. Your Swan 250C will automatically transmit on exactly the same frequency as the one to which you are listening. There is no adjustment for making them the same, since by using the same oscillator for both send and receive, it happens automatically. If separation of receive and transmit frequency contral is desired, the model 210 VFO unit may be used.

TRANSMITTER TUNING CAUTION

The Model 250C covers frequency ranges outside the amateur bands. Care must be exercised not to transmit on these frequencies.

Tuning of the transmitter is not complicated, provided the few simple steps are followed in the correct order. Do not attempt initial tuneup without first performing the procedures for Receive operation described above. The following procedures assume that the unit has been checked out in Receive position, and a high impedance push-to-talk microphone is inserted in the MIC. JACK.

1. Switch the Function Switch to XMIT mode, and observe the cathode current reading on the meter.

2. Quickly rotate the CAR. BAL. control on lower right corner until the meter reads minimum. This will occur with the control near 12 o'clock. If the control has no effect at this time, do not be concerned.

3. Next, adjust the P.A. BIAS control on the back of the chassis until the meter reads 40 ma. This is 40 ma. on the zero to 400 ma. scale.

4. Now, with the Function Switch still in XMIT mode, in rapid succession:

   (a) Turn the CAR. BAL. control clockwise approximately 30 degrees, or one 'hour" in position.

   (b) Rotate the P.A. GRID control for maximum meter reading.

   (c) Rotate the P.A. PLATE control for minimum meter reading, or "dip".

   (d) Readjust CAR. BAL. control for minimum reading.

   NOTE: We cannot overemphasize the importance of avoiding lengthy tune periods! 6146B tubes are quite expensive and can be damaged seriously in a short time if abused. Although the factory will honor all reasonable warranty claims, we cannot replace tubes which have been damaged due to excessive plate or screen grid dissipation. Examination of defective tubes will be necessary before factory replacement can be authorized.

5. Before switching to the TUNE position, it should be noted that the meter will be reading relative R.F. output in this position, instead of cathode current as it does in XMIT and CW position. Switch to the TUNE position, and adjust P.A. PLATE, P.A. GRID, and P.A. LOAD controls for maximum reading. The P.A. PLATE and P.A. LOAD controls will interact with one another, so each time one is peaked, the other should be re-peaked until the highest meter reading is reached. There is no interaction with the P.A. GRID control, so it need only be peaked once.

   NOTE: When in TUNE position, the meter reading at this time is strictly a relative output indication to provide a means for adjusting P.A. PLATE and LOAD controls to maximum output. This method of tuning the Power Amplifier is somewhat different and more effective than "dipping" and "loading" to a specific cathode current. By tuning for maximum output the transmitter will be operating at peak efficiency, and maximum linearity, thus also with minimum distortion products.

6. After the transceiver has been tuned to maximum output, as described in Step 5, it may be of interest to check cathode current. This may be done by switching to CW mode, inserting a CW key in the key jack, and momentarily rotating the CAR. BAL. control to full clockwise position. When the key is pressed the meter will show P.A. Cathode Current, and indicates to what power level the transmitter is tuned. If a CW Key is not at hand, a steady whistle into the mike will produce the same result. It will be found that cathode current reads 250 or more Ma. The cathode current reading will help indicate the condition of the P.A. tubes, although other factors can also affect the reading, such as condition of the driver tube, other tubes used in the transmitter circuitry, and power supply input voltage.

   NOTE—The cathode current level to which the PA is loaded will have no bearing on tube life. When transmitting with normal voice modulation, average power input will be the same regardless of how high or low the PA was loaded while tuning. Peak output, linearity, and lowest distortion will go along with maximum loading. In other words, you will not extend tube life by loading to a lesser degree. The secret of long tube life is simply to keep TUNE-up periods short and not too frequent.

7. For SINGLE SIDEBAND transmission: Leave the function switch in REC. position. Press the Mic. button and adjust CAR. BAL. for minimum output. Then advance the MIC. GAIN control and speak into the Mic. Set the control to the position where the average meter reading with voice modulation is about 125 ma. With the average microphone, the MIC. GAIN control will be set between 9 and 12 o'clock, but it may vary considerably. Avoid excessive MIC. GAIN setting, as this causes adjacent channel splattering and distortion.

8. For AM transmission: Tune the transmitter for maximum output, as described above. Then, leaving the function switch in REC. position, press the Mic. button, and adjust CAR. BAL. for 80 to 90 ma. PA cathode current. Advance the MIC. GAIN control to the position where average voice modulation produces a slight upward flicker of the meter reading. Overmodulation will produce distortion on the transmitted signal.

9. CW OPERATION

   (a) Insert a CW Key in the Key Jack on back of the 250C Transceiver.

   (b) After tuning for maximum output as outlined in Step 5, switch to CW mode, press the key, and insert full carrier by rotating the CAR. BAL. control. Power input will then be the rated 180 watts. In CW operation it will be necessary to switch the Function control back to REC. for receiving and then to CW for transmitting.

   (c) The transmitting frequency will be approximately 800 cycles higher than the receiving frequency. Thus, when two transceivers are tuned to the same frequency, they will hear one another on CW with an 800 cycle tone.

   NOTE: The key jack requires a standard ¼ in. diam., 2 circuit plug. If key clicks are noticeable on transmissions, a .47 or .5 mf capacitor of 200 volt rating may be connected across the key terminals for additional key click suppression.

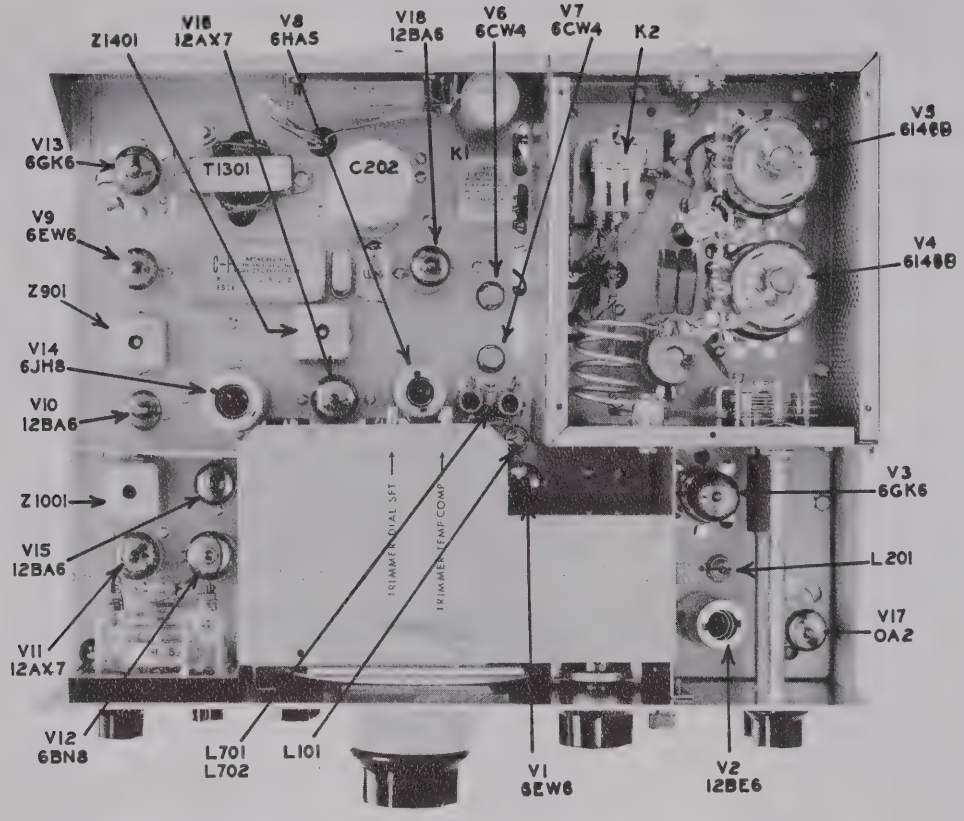


FIGURE 4
TOP VIEW
MODEL 250C
TRANSCEIVER

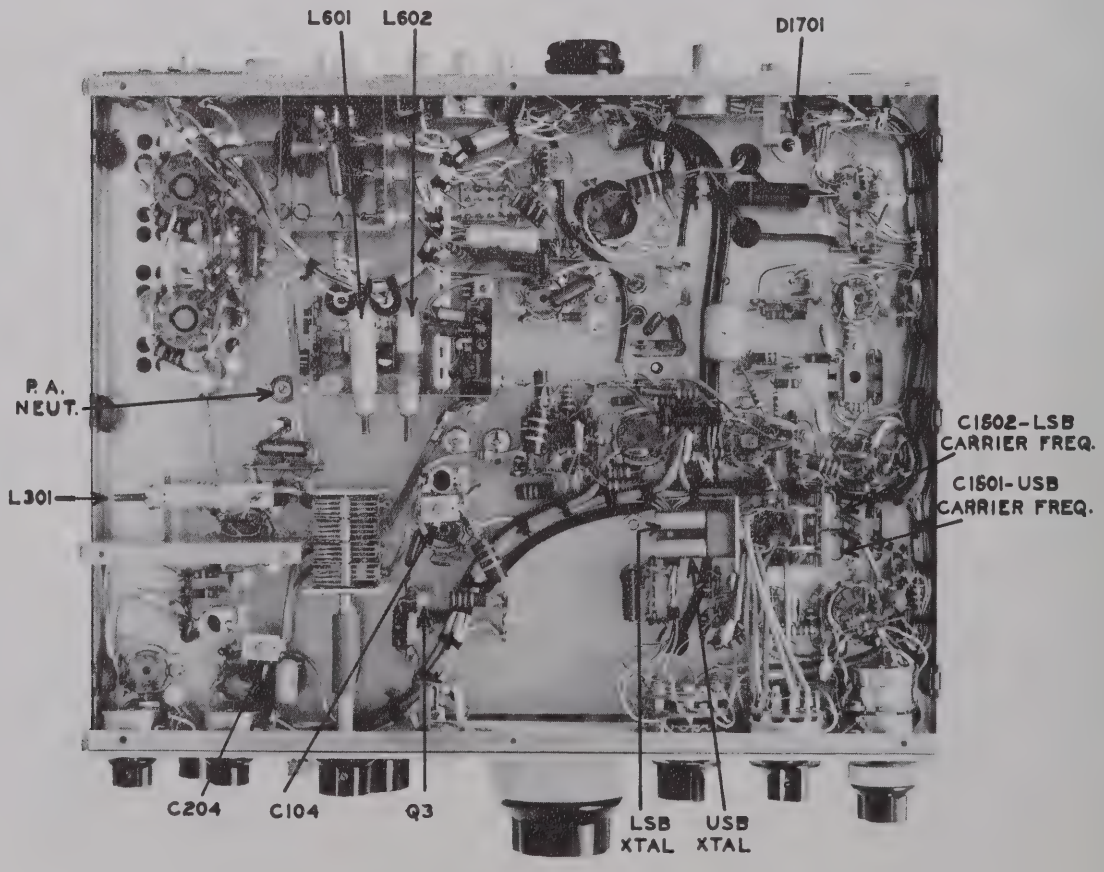


FIGURE 5
BOTTOM VIEW
MODEL 250C
TRANSCEIVER

D. ALIGNMENT AND TROUBLESHOOTING

RECEIVER SECTION:

1. Adjustment of the RF and Mixer Coils, L602, L701, L702. Feed 2 microvolts from a 50 mc. signal generator into the antenna jack, and connect an AC Output Meter to pin 3 of the octal VOX socket. This is the high voltage plate terminal of the AF output stage. Adjust the 3 input coils for maximum output. Then, connect the antenna to the set, and adjust the antenna coil, L602, for maximum AF output either on a signal or on antenna noise. L601 and L604 are preset and should not need adjustment.
2. Adjustment of output IF coil, Z1001 (located in front of V10). To peak this circuit, switch the receiver to AM mode, and adjust for maximum AF noise output.
3. Receiver injection from the VFO amplifier tripler, V1, is maximized by tuning L101, C104, and C105A. However, these are also transmitter adjustments, so normally they are not adjusted in receive mode, except to peak C105, the front panel control, (PA GRID) for maximum noise level.
4. Loss of receiver volume or sensitivity will normally require tube testing. Voltages may be measured and referred to the voltage chart to trace possible failure of a resistor or capacitor. However, a high percentage of problems will involve one or more of the tubes. In the received circuitry, these will be: V1, V6, V7, V8, V9, V10, V11, V12, V13, and V15.

FREQUENCY CALIBRATION, APPLIES TO BOTH RECEIVE AND TRANSMIT MODES:

The Megacycle Range capacitor is C2015, and is set to exactly maximum capacity when tuning the lower 500 KC of the 50 mc. amateur band. C2016 is in series with C2015 and determines the spread from 50.0 to 53.5 mc on the MC. Range Dial. The Kilocycle Tuning capacitor is C2010, and it is calibrated in kilocycles from zero to 500. On the back side of the VFO compartment are two locking type trimmers. The one on the left side is C2014, and is used for setting dial calibration. The other one is C2011, and it is adjusted only when temperature compensation needs to be changed. The calibrator is required for adjustment of C2014.

CALIBRATION PROCEDURE:

1. Loosen the locking device on the MC Range dial. Set C2015, the megacycle range capacitor, to maximum capacity. Determine this by moving a signal on the kilocycle dial as far up the 0-500 dial scale as possible. In other words, as the MC dial is turned toward greater capacity, it will cause a given signal to move upward on the 0-500 kc scale. Rock the MC dial back and forth, until it is determined that maximum capacity has been reached. The index line on the panel will be quite close to the 50 mc line on the dial.
2. After the MC dial has been set to maximum capacity, tighten the locking device. Then tune for the 50 MC calibrator signal on the 0-500 kc dial. It should come in at zero on this dial. Adjust the VFO trimmer, C2014, so it does.

NOTE:

C2016, the MC BANDSPREAD CAPACITOR, is located on the right side of the VFO compartment. This capacitor is pre-set at the factory and should not need adjustment.

Note that with this calibration system, the frequency cannot be tuned below 50 mc as long as the KC dial is not tuned below the zero index. Adjustment of the MC dial can only move the frequency up higher in the band. This is the reason for wanting to make sure the MC dial is set exactly at maximum capacity before setting C2014.

After the above calibration adjustment has been made, the MC dial will read approximately correct. As it is moved up in .5 mc steps (500 kc steps), the KC dial will tune 50.5 to 51 mc, 51 to 51.5 mc, etc. Accuracy of the KC dial, however, will be most nearly correct in the 50 to 50.5 mc range. It will be quite close in the 50.5 to 51 mc range, and then will begin deviating to where in the 53.5 to 54 mc range it will be useful primarily as a logging scale. With the 250 kc calibrator, any 250 kc point can be accurately determined, and other frequencies can be closely interpolated.

ADJUSTMENT OF CARRIER FREQUENCY

A. NORMAL SIDEBAND, with RECEIVER FUNCTION set to USB position. The carrier frequency trimmer, C1501, is mounted on a bracket under the chassis near the carrier oscillator, V15. There are two trimmers mounted side by side. The front trimmer is C1501, used with USB. The rear trimmer is C1502, used with LSB. Be sure to adjust the correct trimmer. The normal sideband carrier should be adjusted to exactly 10,898 KC. Check audio roll-off with an audio generator coupled into the mike jack, and a dummy

load connected to the antenna jack. Adjust C1501 6 db roll-off at 300 cycles.

B. OPPOSITE SIDEBAND, with RECEIVER FUNCTION set to LSB position. The opposite sideband carrier is 10901 KC. C1502. Adjustment is the same as the normal sideband.

PA NEUTRALIZATION

1. Connect a dummy load to the antenna jack.
2. Set PA tune and PA load controls to 9 o'clock, and frequency to approximately 50.2 mc.
3. Press Mic. button, insert a small amount of carrier with the Car. Bal. control, and adjust PA grid for maximum PA cathode current. Then adjust Car. Bal. control for 100 ma meter reading. Do not hold Mic. button pressed for more than a few seconds during this adjustment.
4. With the Mic. button pressed, and the PA cathode reading 100 ma, slowly turn the PA tune control from 9 o'clock to 3 o'clock. A smooth resonance dip should be observed, with no rise or peak occurring on either side of the dip. If a peak is noticed, adjust the PA neutralizing capacitor, C410, in the direction which eliminates the peak.

CRYSTAL CALIBRATOR FREQUENCY ADJUSTMENT

Adjustment of the Crystal Calibrator must be made with an outside source, such as an external receiver that will tune to WWV. Remove transceiver cabinet and locate the calibrator oscillator tube, V18. Wrap one end of an insulated wire lead loosely around V18. Connect the other end to the antenna terminal of the external receiver. Tune external receiver to zero zeat WWV. Now turn on calibrator in 250C and by listening to it on the external receiver, adjust trimmer capacitor (C1803) to zero beat with WWV.

S-METER ADJUSTMENT

With antenna disconnected and with RF Gain fully clockwise, set R1001, located on rear panel, for zero meter reading. Make sure no local signals are being received.

DRIVER STAGE ADJUSTMENTS

1. Driver coils, L101, L201, L301. Set frequency to 50.2 mc, and PA grid control to 10 o'clock. Press the Mic. button, and insert carrier for about 100 ma PA cathode reading. Tune PA plate for resonance dip.
2. Adjust L101, L201, L301 for maximum meter reading.
3. Driver coil tracking has been factory adjusted and will not normally require further adjustment. If operation at the high end of the 6 meter band is required, and output power drops excessively, tracking can be adjusted by turning mica trimmers C104 on the VFO amp., and C204 on the transmit mixer stage. The trimmers should be peaked at the high frequency end, and the coil cores at the low end, with these adjustments repeated back and forth in the usual manner until proper tracking is achieved.

TROUBLESHOOTING GUIDE	
DEFECT	**POSSIBLE CAUSE**
PA IDLING CURRENT UNSTABLE	1. Defective 6146B 2. Defective Bias Potentiometer 3. Defective Bias Supply
INABILITY TO LOAD TO 200-250 MA	1. V2, V3, V4, V5 Defective 2. Driver Stage Improperly Tuned 3. Trans. Mixer Improperly Tuned 4. VFO Amplifier Improperly Tuned 5. Antenna Not Resonant at Frequency 6. Defective Transmission Line
INSUFFICIENT CARRIER SUPPRESSION	1. Carrier Balance Control Improperly Adjusted 2. Defective 6JH8 Balanced Modulator 3. Carrier Oscillator Frequency Incorrect
INSUFFICIENT SIDEBAND SUPPRESSION	1. Excessive MIC. Gain 2. Incorrect PA Load Adjustment 3. Carrier Oscillator Frequency Incorrect
MICROPHONICS IN RECEIVER	1. Z1001 Improperly Tuned 2. V15, V11, V9, V8, V7, or V6 Defective
LOW RECEIVER SENSITIVITY	1. Pa Grid Improperly Set 2. K2 Back Contacts Defective 3. V6, V7, V8, V9, V10, V11, V12, V13 Defective

VOLTAGE CHART

TUBE TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1	R	0	.75	6.3	0	160	160	0		
6EW6	T	0	.75	6.3	0	150	150	0		
V2	R	—110	0	12.6	0	280	250	0		
12BE6	T	0	0	12.6	0	260	100	0		
V3	R	0	—35	0	6.3	0	0	280	280	0
6GK6	T	0	—6	0	6.3	0	0	275	275	0
V4	R	0	6.3	0	0	—70	0	0	0	
6146B	T	0	6.3	260	0	—70	0	0	0	
V5	R	0	12.6	0	0	—70	0	6.3	0	
6146B	T	0	12.6	260	0	—70	0	6.3	0	
V8	R	0	0	12.6	6.3	150	0	2		
6HA5	T	0	0	12.6	6.3	0	0	0		
V9	R	—1	0	12.6	6.3	280	125	0		
6EW6	T	0	0	12.6	6.3	250	100	0		
V10	R	0	0	12.6	0	280	100	1.5		
12BA6	T	0	0	12.6	0	250	0	0		
V11	R	140	0	1	12.6	0	200	0	2	6.3
12AX7	T	50	0	.5	12.6	0	250	—100	0	6.3
V12	R	—.5	0	—.5	6.3	12.6	0	250	25	80
6BN8	T	—.5	0	—.5	6.3	12.6	0	100	10	40
V13	R	0	—4	0	12.6	6.3	0	280	280	0
6GK6	T	0	—4	0	12.6	6.3	0	260	260	0
V14	R	20	20	0	6.3	0	—100	0	0	0
6JH8	T	20	20	125	6.3	0	0	0	150	150
V15	R	—1	0	0	12.6	50	80	1.5		
12BA6	T	—.75	0	0	12.6	50	80	1.5		
V16	R	80	0	0	6.3	6.3	125	0	0	0
12AX7	T	50	0	0	6.3	6.3	50	0	0	0
V17	R	150	0	0	0	150	0	0		
OA2	T	150	0	0	0	150	0	0		
V18	R	0	0	12.6	0	280	280	100		
12BA6	T	0	0	12.6	0	260	260	100		
PIN NUMBER						2	4	8	10	12
V6	R					70	0	0	6.3	0
6CW4	T					0	0	0	6.3	0
V7	R					130	25	70	6.3	0
6CW4	T					0	0	0	6.3	0

All voltage measurements made with Simpson Model 260, 20K Ohms per volt, or equivalent.

PARTS LIST

CAPACITORS All capacity values listed in pico farads, unless otherwise specified.

C101	.002; 20%
C102	.002, 20%
C103	.01, +80–20
C104	20pf Trimmer
C105	4 Section Variable, 5pf per section
C106	.002, 20%
C107	.5pf, 10% QC
C201	.002, 20%
C202	40–40 MFD, 450–450 WV Elect.
C203	.002, 20%
C204	20pf Trimmer
C205	.1 mf, 200 volt
C206	.002, 20%
C301	.002, 20%
C302	.002, 20%
C303	540pf, 5%
C304	.002, 20%
C401	.01, +80–20
C402	.01, +80–20
C403	.01, +80–20
C404	200pf variable, P.A. Load
C405	20pf variable, P.A. Tune
C406	.002, 20%
C407	.002, 20%
C408	270pf, 2.5kv Mica
C409	270pf, 2.5kv Mica
C410	20pf variable, P.A. Neut.
C411	.002, 20%
C412	.002, 20%
C413	.002, 20%
C414	.002, 20%
C415	.002, 20%
C416	.002, 20%
C417	.002, 20%
C418	.002, 20%
C419	.002, 20%
C601	120pf, 5%
C602	.001, 20%
C603	.001, 20%
C604	.001, 20%
C605	100pf, 5%
C701	5pf, ±5NP0
C703	.001, 20%
C704	.01, +80–20
C705	.001, 20%
C801	.001, 20%
C802	.001, 20%
C803	120pf, 5%
C804	.001, 20%
C805	220pf, 5%
C806	.001, 1kv Feed Thru
C901	.01, +80–20
C902	10pf, 10% N1500
C903	.01, +80–20
C904	.01, +80–20
C905	.01
C1001	.01, +80–20
C1002	.01, +80–20
C1003	.01, +80–20
C1004	.01, +80–20
C1101	150pf, 5%
C1102	220pf
C1103	.002, 20%
C1104	.22 mf, 200 volt
C1105	.001, 20%
C1201	.002, 20%
C1202	.001, 20%
C1203	.001, 20%
C1204	.01 +80–20
C1205	.01, +80–20
C1301	220pf
C1302	.01, +80–20
C1303	.0047 mf, 1kv
C1304	.01, +80–20
C1401	.01, +80–20
C1402	.01, +80–20
C1403	220pf
C1404	.01, +80–20
C1405	.01, +80–20
C1406	.01 mf, 400 volt
C1501	6–30pf, Trimmer
C1502	6–30pf, Trimmer
C1503	30pf, 5%
C1504	20pf, 5%
C1505	.002, 20%
C1506	20pf, 5%
C1507	.01, +80–20
C1601	.01, +80–20
C1602	.01, +80–20
C1603	100pf, 20% N1500
C1604	.01, +80–20
C1801	150pf, 5%
C1802	.01, +80–20
C1803	80pf Trimmer
C1804	28 mc. trap
C1901	.001, 1kv Feed Thrus (7)
C1902	.002, 2kv
C1903	10 mf, 150 volt
C1904	80 mf, 150 volt Elect.
C1905	.01, +80–20
C1906	1 mf, 50 volt
C2001	470pf, 5%
C2002	.01, +80–20
C2003	.002, 20%
C2004	430pf, 2%
C2005	430pf, 2%
C2006	27pf, 5%
C2007	270pf, 2%
C2008	470pf, 5%
C2009	.01, +80–20
C2010	5–12pf, Main Tuning
C2011	10pf variable
C2012	10pf N470
C2013	20pf N150
C2014	10pf variable
C2015	80pf variable
C2016	50pf variable
C2017	22pf N75
C2018	10pf NPO
C2019	12pf.

RESISTORS

R101	12k –2W
R102	47k –1W
R103	56
R104	47
R201	1k –1W
R202	27K
R203	27k
R204	18k –2W
R301	100k
R302	270k
R303	100
R401	10k
R402	1k
R403	27k
R404	100
R405	100
R406	1k
R407	100
R408	1.5k
R409	1 –1W –5%
R410	1 –1W –5%
R411	10k P.A. Bias
R412	10k –1W
R601	100k
R602	56
R603	470k
R701	27k –1W
R702	18k –2W
R801	100k
R802	470

R803	33k
R804	68 −1W
R901	1k
R902	470
R903	47k
R904	1k
R1001	1k S Meter Zero
R1002	470k
R1003	100
R1004	47
R1005	47k −1W
R1006	68k
R1007	1k
R1101	10k
R1102	270k
R1103	1k
R1104	100k
R1105	1 meg
R1106	270k
R1107	2.7k
R1108	100k
R1201	470k
R1202	47k
R1203	1k
R1204	47k
R1301	1 meg AF Gain
R1302	270k
R1303	470k
R1401	47k
R1402	47k
R1403	150k
R1404	47k
R1405	100k
R1406	1k
R1407	47k
R1408	100k
R1409	27k
R1410	5k Car. Bal.
R1501	27k
R1502	27k
R1503	1k
R1504	270
R1505	1 meg
R1506	120 −1W
R1601	150k
R1602	1k
R1603	1 meg Mic. Gain
R1604	270k
R1605	2.2 meg
R1606	47k
R1801	27k
R1802	100k
R1803	1 meg
R1901	470
R1902	500 −10W
R1903	500 −10W
R1904	750 10−W
R1905	6k −10W
R1906	270k
R1907	270k
R1908	470k −1W
R1909	27k
R1910	27k
R1911	10k
R1912	10k RF Gain
R1913	270k
R1914	100k
R2001	470
R2002	100
R2003	2.7k
R2004	2.7k
R2005	470 −5%
R2006	2.7k
R2007	2.7k
R2008	470 −5%
R2009	1k −5%
R2010	1k −5%
R2011	1k −5%

All resistors are ½ watt rating, 10% tolerance unless otherwise specified.

RELAYS

K1	4 PDT, 12 VDC Coil
K2	2 PDT, 12 VDC Coil

CRYSTALS

Y1501	10,898kc., Car. Osc.
Y1502	10,901kc., Car. Osc.
Y1801	250kc., Xtal. Cal.

TUBES

V1	6EW6 VFO Amp.
V2	12BE6 Trans. Mixer
V3	6GK6 P.A. Driver
V4	6146B P.A.
V5	6146B P.A.
V6	6CW4 1st RF Amp.
V7	6CW4 2nd RF Amp.
V8	6HA5 Rec. Mixer
V9	6EW6 1st IF Amp.
V10	12BA6 2nd IF Amp.
V11	12AX7 Prod. Det./ Rec. AF
V12	6BN8 AGC Amp./Rect.
V13	6GK6 AF Output Amp.
V14	6JH8 Bal. Mod.
V15	12BA6 Car. Osc.
V16	12AX7 Mic. Amp.
V17	0A2 Volt. Reg.
V18	12BA6 250kc. Osc.

TRANSISTORS

Q1	2N706
Q2	2N706
Q3	2N706

DIODES

D1701	1N2974A Zener
D1901	RCA 38679
D1902	RCA 38679
D401	1N34A

TRANSFORMERS

T1301	AF Output
Z401	Parasitic Suppressor
Z402	Parasitic Suppressor
Z901	10,900 kc IF Trans.
Z1001	10,900 kc IF Trans.
Z1401	10,900 kc Bal. Mod. Trans.

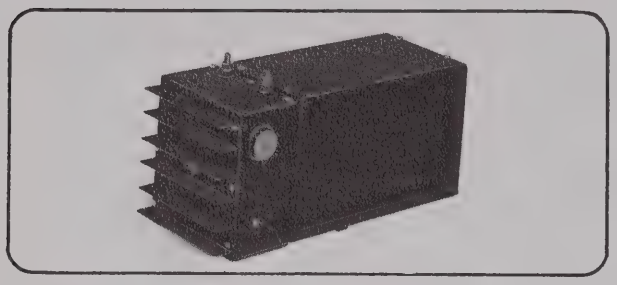
SWITCHES

S1	Power On-Off
S2	LSB - USB - AM REC.
S3	CAL-REC-XMIT-CW-TUNE

COILS

L101	39.1-43.1 mc −.5 uh
L201	50-54 mc −.25 uh
L301	50-54 mc −.2 uh
L302	17 uh
L401	17 uh
L402	50-54 mc
L403	7 uh
L404	17 uh
L601	.15 uh
L602	.6 uh
L603	6.8 uh
L604	.5 uh
L701	.75 uh
L702	.9 uh
L1101	200 uh
L1801	17 uh
L1901	.82 uh
L1902	.82 uh
L1903	.82 uh
L2001	13.034-14.367 mc VFO Coil
L2002	13.034-14.367 mc VFO Coil
L2003	17 uh
L2004	200 uh
L2005	

250-C POWER SUPPLIES AND COMBINATIONS



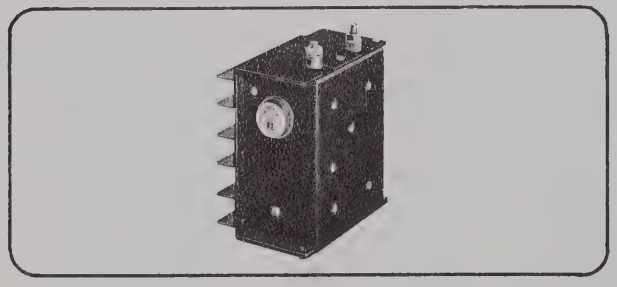
COMPLETE 12 VOLT D.C. SUPPLY

MODEL 14-117

Consists of a 117-X A.C. supply and a 14-C D.C. Converter. For 12-13.5 volt mobile or portable operation. Includes 8 ft. cable and plug pre-wired for connection to transceiver, primary cables, circuit breaker, and mounting hardware. 5 in. wide, 5 in. high, 12-1/4 in. long. Weight: 16-1/2 lbs.
Net Price. $130

MODEL 14-230. Same as above but with 230-X A.C. unit. Net Price. $140

Model 14-117 and 14-230 D.C. supplies will operate on A.C. input by detaching the 14-C unit and attaching an A.C. line cord, thus providing added versatility. 117 volt and 230 volt A.C. line cords available at $8 each.

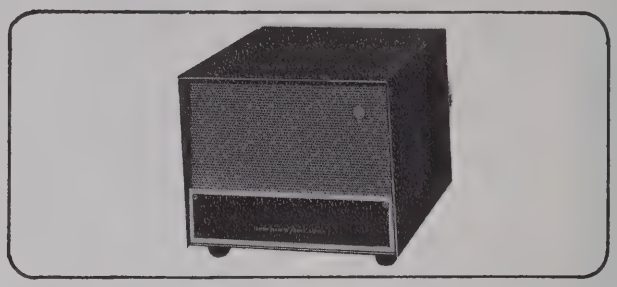


D.C. CONVERTER MODULE

MODEL 14-C

Transistorized Unit attaches to 117-X or 230-X power supply, converting them to 12-13.5 volt D.C. input for mobile or portable operation. For negative ground systems. Includes cables, plugs, circuit breaker, and mounting hardware. Average current drain: 9 amps. receive. 22 amps. transmit.
Dimensions: 5 x 5 x 3-1/2 in. Weight: 2-1/2 lbs.
Net Price: $65

MODEL 14-CP. Same as above but for positive ground system. Available on special order. . . . $75



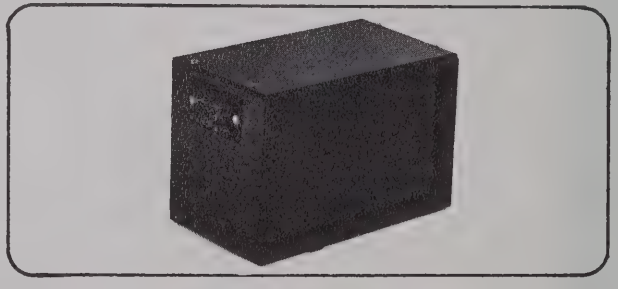
COMPLETE MATCHING A.C. SUPPLY

MODEL 117-XC

Consists of a 117-X power supply in a cabinet which matches Swan transceiver. Includes speaker, phone jack, and indicator light. Come with A.C. line cord, and power cable ready to plug into transceiver. 8 in. wide, 5-1/4 in. high, 11 in. deep.
Weight: 21 lbs. Net Price:. $105

MODEL 230-XC. Same as above but with 230-X supply for dual 117 or 230 volt A.C. input. Comes with 230 volt line cord, unless otherwise specified.
Net Price: $115

Model 117-XC and 230-XC A.C. supplies will operate on 12-13.5 volts D.C. input by attaching a 14-C Converter Unit in place of the A.C. line cord, thus providing added versatility for portable or emergency operation from a 12 volt battery.



BASIC A.C. POWER SUPPLY

MODEL 117-X

Operates with 117 volts, 50-60 cycle input. Supplies all voltages required to operate Swan transceiver. Does not include matching cabinet, speaker or cables. Average power consumption: 125 watts, receive; 325 watts, transmit.
Dimensions: 5 x 5 x 8-3/4 in. Weight: 14 lbs.
Net Price: $65

MODEL 230-X. Same as above but with dual primary winding for either 117 or 230 volt 50-60 cycle input. $75

A.C. line cords for above supplies, with fuse, ready to plug in. Specify for 117 or 230 volts, each. . .$8

8 ft. 10 conductor cable with pre-wired plug for connecting A.C. supply to transceiver, each. $6

GENERAL DESCRIPTION:

The Swan Power Supply systems are designed to provide all necessary voltages required by Swan Transceiver models 240, 250, 250C, 350, 350C, 500 and 500C. This also includes the 300 Series and 400 Series commercial models. The model 117X basic A.C. supply is designed for an input of 117 volts at 50 or 60 cycles. The model 230X is identical except that it operates with 230 volts AC input. By simply changing line cords, it will also operate on 117 volts A.C.

For fixed station use, the 117-X or 230-X is installed in a cabinet which matches the Swan transceivers. This cabinet also contains a speaker, phone jack, and indicator light. The complete combination is designated as model 117-XC or 230-XC. The A.C. line cord plugs into the back of the supply. In the 230-XC, choice of 117 or 230 volts input is made by selecting line cords.

12 VOLT D.C. OPERATION:

A D.C. Converter attaches to the back of the A.C. supply, and converts it for 12-13.5 volts D.C. input. The model 14-C D.C. Converter is for negative ground systems, the most common type. (For positive ground systems, the model 14-CP D.C. converter is available on special order.) Combination of an A.C. supply with a 14-C Converter is designated as model 14-117 or 14-230 depending on which A.C. supply is used. The positive ground models are designated as model 14P-117 or 14P-230.

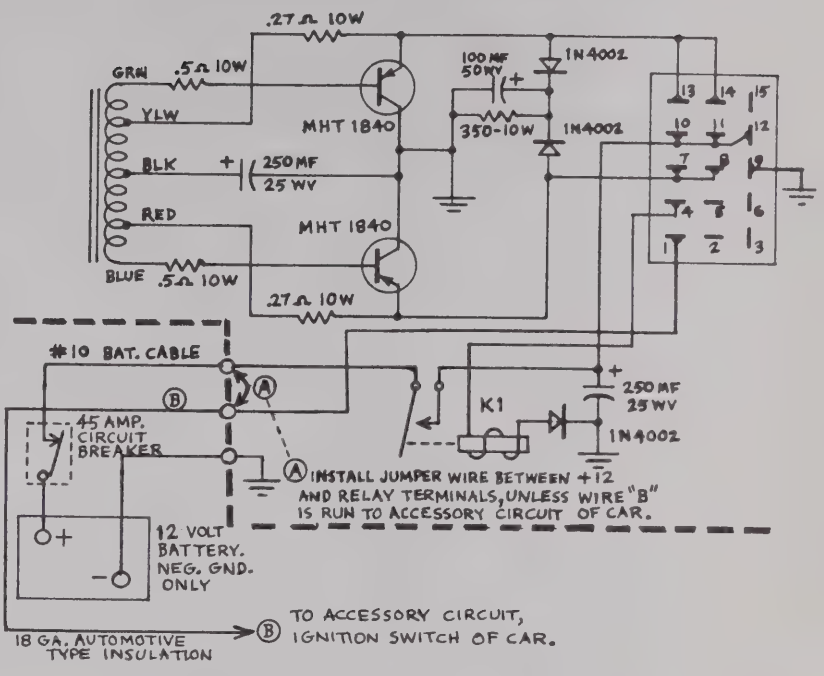
With the versatility of this power supply design, a number of advantages become apparent. The 14-117 mobile supply may be operated from a 117 volt A.C. line by detaching the D.C. Converter and plugging in an A.C. line cord.

The matching A.C. supply, model 117-XC or 230-XC, may be converted easily to 12-13.5 volts input by attaching the 14-C D.C. converter to the back. This provides for portable or emergency operation from a 12 volt battery. There may also be times when it will be desirable to operate temporarily in an automobile, such as during a vacation trip, field day, or emergencies. The 117-XC can be set on the floor or front seat, and with the 14-C attached it becomes a 12-volt power supply, complete with speaker.

SPECIFICATIONS:

Power Rating: 250 watts average, 600 watts peak.
Input:
Model 117-X: 117 volts nominal, 50-60 cycles.
Model 230-X: 230 volts or 117 volts, 50-60 cycles.
Model 14-C: 13.5 volts D.C. nominal, 40 amps. peak.

SWAN MODEL 14-C D.C. CONVERTER FIG. 1



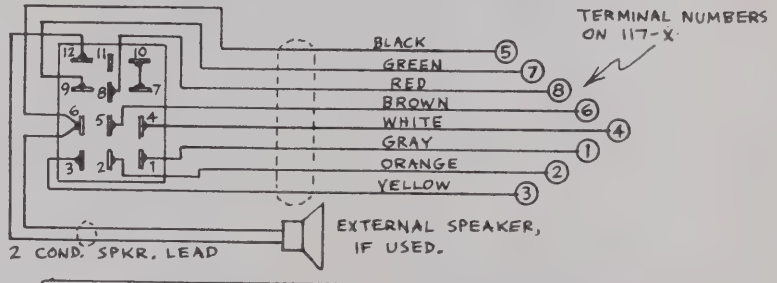


FIG. 2 PREWIRED PLUG AND CABLE, SUPPLIED WITH 14-C

Output:
800 volts at 250 ma. average, 700 ma. peak.
275 volts at 150 ma. continuous.
110 volts negative bias, at 100 ma.
12 volts D.C. at 200 ma., relay supply.
12.6 volts A.C. at 5.5 amps. (with A.C. input only)
Battery Drain with Swan Transceiver
Rec: 3.5 amps. Trans: 16 amps. average, 40 amps. peak, plus 5.5 amps. for vacuum tube heaters.

The D.C. Converter uses two power transistors for switching in a flip-flop oscillator circuit. A large

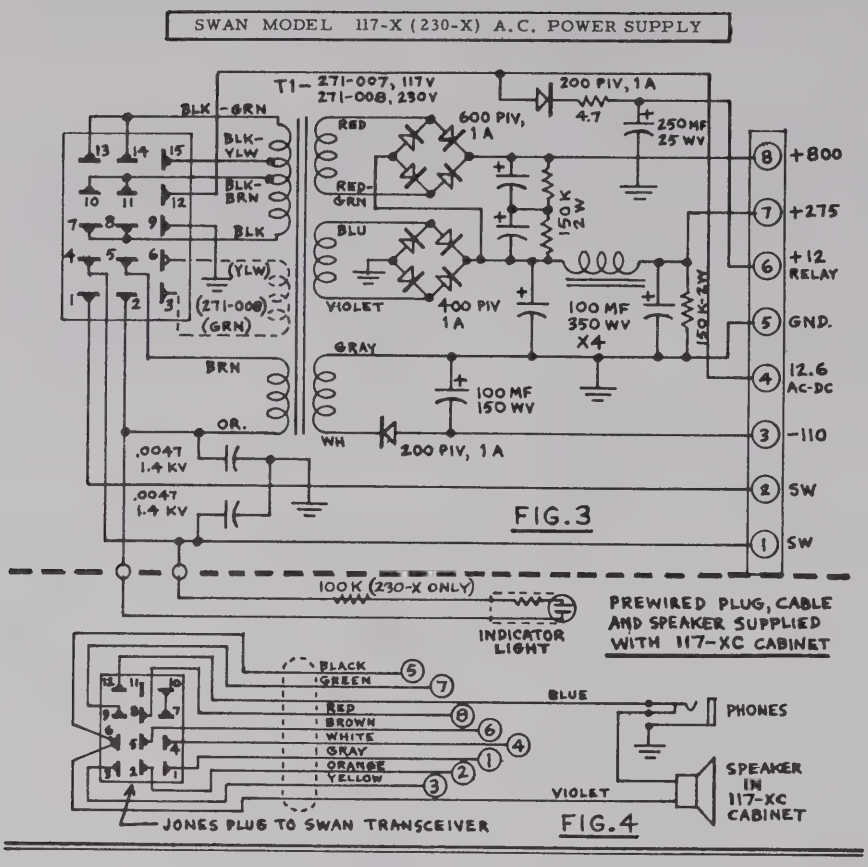


Fig. 6

9-7-65
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portion of the cost in this unit is in the transistors where no compromise has been made. They are rated at 60 amperes, with a 45 volt rating.

MATCHING CABINET:

Ordinarily the A.C. supply will be purchased complete in a matching cabinet as either model 117-XC or 230-XC. However, in some cases an owner may have purchased a 117-X or 230-X basic supply only, perhaps in a D.C. supply combination, and he may wish later on to mount it in a matching cabinet. For this purpose the cabinet with speaker and cables is available separately. The basic A.C. supply mounts inside with three screws, and the pre-wired cable connects as shown in the schematic. Connections to the phone jack and speaker have already been made. Two leads from the indicator light must be run through grommet and soldered to the terminals provided at the bottom of the supply. Refer to the schematic for clarification. The A.C. line cord is also provided with the matching cabinet kit. These line cords are available separately also, and come normally wired and stamped for 117 volts. 230 volt line cords are also available on special order, or the 117 volt line cord may easily be wired for 230 volts by referring to the schematic. Note that the 230 volt line cord will work only with the 230-X basic A.C. supply. The 117 volt line cord will work with either the 117-X or 230-X.

ELECTRICAL DESIGN:

Both the A.C. and D.C. sections are conservatively designed for long, reliable service with a minimum failure rate. At the same time, they are designed for easy access and servicing for those times when it is

117 volt line cord may easily be wired for 230 volts by referring to the schematic. Note that the 230 volt line cord will work only with the 230-X basic A.C. supply. The 117 volt line cord will work with either the 117-X or 230-X.

ELECTRICAL DESIGN:

Both the A.C. and D.C. sections are conservatively designed for long, reliable service with a minimum failure rate. At the same time, they are designed for easy access and servicing for those times when it is required. Any component can be readily checked out and replaced in a matter of moments. The D.C. Converter and A.C. supply can be detached quickly from one another and tested individually, thus isolating the source of trouble.

The A.C. supply is quite conventional, using a silicon rectifier bridge for the medium voltage, and another for high voltage. The 117-X has a single primary winding for 117 volt input, while the 230-X has a pair of primary windings which connect in parallel for 117 volts, and in series for 230 volts. The switching is taken care of in the A.C. line cord plug.

MOBILE INSTALLATION
Model 14-117 or 14-230.

12-13.5 volts D.C., Negative ground only. (For positive ground systems, the D.C. converter unit must be a model 14-CP, available from your dealer on special order.)

(A) **Preliminary Steps.** The D.C. electrical system in an automobile will sometimes generate high voltage transients. This can be caused by the starter motor, the alternator or generator, or loose wiring, and can represent a serious hazard to the transistors in your DC power supply. By selecting the best transistors available for the application, your Swan supply is capable of absorbing a good deal of abuse, but there is a limit to what even the best transistors can take and for this reason we strongly urge that you read the following notes completely, and follow them carefully. When this is done, you will find that your Swan power supply is extremely rugged and reliable. Field problems with the 14-117 supply are exceptionally low. But, first observe the following steps.

(1) Clean and tighten the battery terminals and clamps.

(2) Tighten battery cables where they attach to the starter solenoid and engine block.

(3) Inspect battery cables for corrosion or wear. Replace them if they look questionable.

(4) Check battery condition frequently. If the cells do not hold a similar charge or water level, replace the battery.

(5) Check alternator, (or generator), and regulator connections for tightness. Also, primary ignition wiring, horn wiring, lights, etc.

(6) Measure the charging voltage from the alternator. Often the regulator is misadjusted, and the voltage setting may be excessive. It should not read more than 14.5 volts at normal engine speeds.

(B) Locate the power supply under the hood in a reasonably clear spot as close to the battery as is practical, and away from the engine. Particularly, keep it clear of the engine manifold, and away from the high tension ignition wiring. On many cars there will be a good spot at the front and to one side of the radiator. The power supply may mount in any position, and is quite well protected against normal splashing and dirt. The 117-X unit attaches to the car with three sheet metal screws. Remove the 117-X cover, and locate the three mounting holes. The 14-C Converter attaches to the 117-X with the long machine screw.

In some cars it may be impossible to find room enough under the hood for the 14-117 assembly. If necessary, the 14-C and 117-X units can be separated 2 or 3 feet, and connected electrically with appropriate Jones plugs. 10 gauge wire is then required between terminals.

In other cases, it may be advantageous to install the 14-117 under the dash, or in the trunk of the car. Heavy battery leads with adequate automotive type insulation must be used. For trunk mounting, at least 6 gauge cables are recommended. In all installations the circuit breaker must be mounted close to the battery. Never run a long cable from the hot battery terminal to the power supply without a fuse or circuit breaker close to the battery. Failure to observe this rule will result in a serious fire hazard!

(C) Connect a cable from the hot battery terminal to the circuit breaker, keeping this cable as short and direct as possible. Then connect a cable from the circuit breaker to the +12 post on the 14-C converter unit. Next, connect a cable from the negative post of the 14-C unit to the ground terminal of the battery. If possible, drill and tap a hole in the battery post for a contact stud. The more directly the cables are connected to the battery, the less chance there will be for voltage transients to reach the transistors.

(D) Run the 10 conductor power cable from the transceiver to the power supply and connect by color code as illustrated in the schematic diagram

(E) There are two ways of wiring the relay circuit in the 14-C converter. The simplest method is to connect a wire jumper from the relay terminal post to the +12 terminal on the 14-C. These posts are just an inch apart, and an 18 gauge bare jumper is sufficient. However, when connected this way, it will be possible for anyone to turn on the transceiver at any time, and for the transceiver to be accidentally left on, running the battery down.

The second wiring method provides for connection to the accessory circuits of the car, so that the ignition key is required in order to turn on the transceiver. To do this an 18 gauge insulated wire must be run from the 14-C relay terminal to the accessory circuit under the dash of the car. This wire may be run alongside the 10 conductor power cable which goes to the transceiver. The accessory circuit will be found on one terminal of the ignition switch. Your service garage can be helpful in locating this. Otherwise, it may be easier to locate the 12 volt input line to the car radio, and splice into this line. Since the 14-C relay draws very little current, tapping into the car radio line will not matter, regardless of which side the car radio fuse is on.

(F) Speaker Connections. The two conductor lead coming from the Jones plug goes to an external speaker with 3 to 4 ohm voice coil. This speaker may be one already installed in the dash of the car or under the dash, and a selector switch may be installed to switch the speaker over from the car radio to the transceiver.

VOLTAGE REGULATION, MOBILE OPERATION

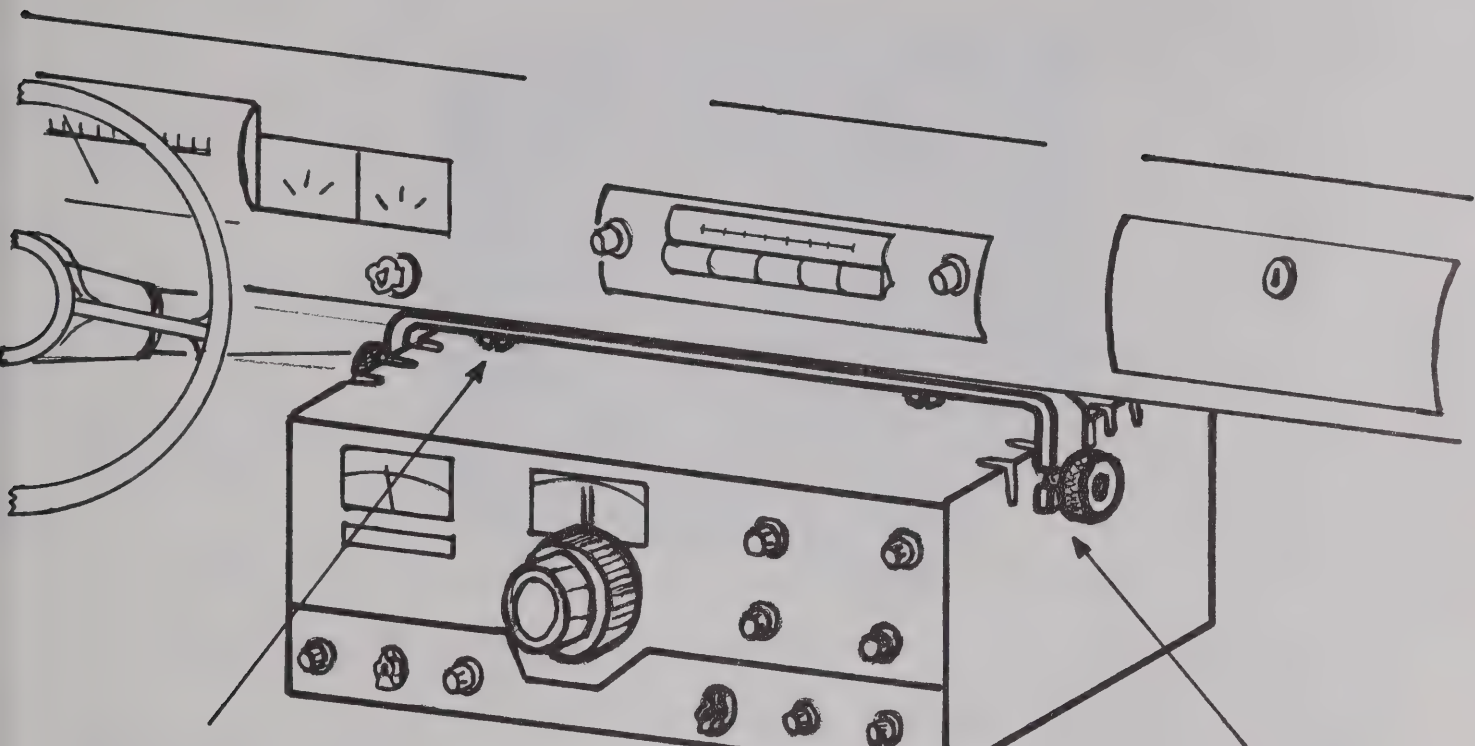
In D.C. to D.C. converters designed for mobile operation of Transceivers, it is important to note that output voltages will be related directly to the D.C. input voltage. The Swan model 14-117 supply is designed so that when input voltage is 13.5 volts, output voltages will be at nominal ratings, the same as with 117 volts A.C. input. Therefore, when Transceiver Tuning is performed without the engine running, it must be recognized that operating voltages will be considerably lower than normal, and meter readings will be less than with the engine running. In some cases, input voltage without the engine running may be as low as 11.5 volts, resulting in still lower meter readings. If the D.C. supply were designed to deliver normal output voltages at 11.5 or 12 volts input, then they would be dangerously high with the engine running.

The wire size and length of run from the battery to the 14-C converter is also an important factor governing output voltage from the power supply. The voltage drop across these leads should be kept reasonably small. 10 gauge wire is supplied with the 14-C converter, and is heavy enough for average runs of 3 to 4 feet. For longer runs it would be advisable to use 8 gauge, while for trunk mounted power supplies 6 gauge or even 4 gauge is recommended. It should be noted, however, that the really important factor in determining wire size is how much input voltage is delivered to the 14-C module during average voice modulation, when some 16 to 18 amperes are being drawn through the wire. In TUNE position considerably more current is drawn, as much as 35 to 40 amperes, and the voltage drop may be quite high. However, this is not a particular handicap; in fact, there is a definite safety factor in having a rather poorly regulated input which drops when you switch to TUNE. There is no reason to be unduly concerned about this drop, since the electrolytic capacitors in the power supply have ample storage capacity to provide good dynamic regulation during voice modulation.

To summarize: The best way of determining if the battery leads are large enough is to measure input voltage at the 14-C terminals while voice modulating. If the voltage drops less than 1/2 volt when speaking normally into the microphone, the leads are heavy enough. If the drop is more than 1/2 volt, the leads should be larger. Finally, do not expect full operating power unless the engine is running, and the generator is charging properly.

POWER SUPPLY WARRANTY POLICY

The normal guarantee on your Swan power supply is for a period of 90 days from date of purchase, and covers all components, material and workmanship. In the case of transistor failure, however, the warranty on them will be void if inspection proves that high transient voltages from the automobile were responsible. We will do all in our power to be fair and just in this determination. The warranty card must be filled out and mailed to the factory within 10 days from date of purchase. Do not ship a unit to the factory for servicing without prior authorization. Check with your dealer first, as he may be in a position to handle the service work more quickly. This warranty is void if the equipment has been misused or damaged.



Secure mounting bracket to under side of dash with large sheet metal screws.

Locate the best cabinet slot for mounting, and attach hardware as illustrated

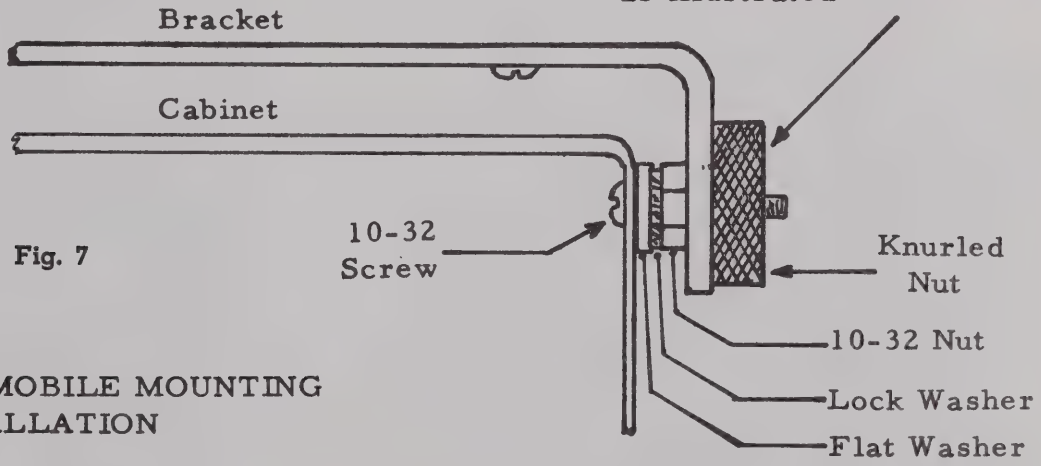


Fig. 7

TYPICAL MOBILE MOUNTING INSTALLATION

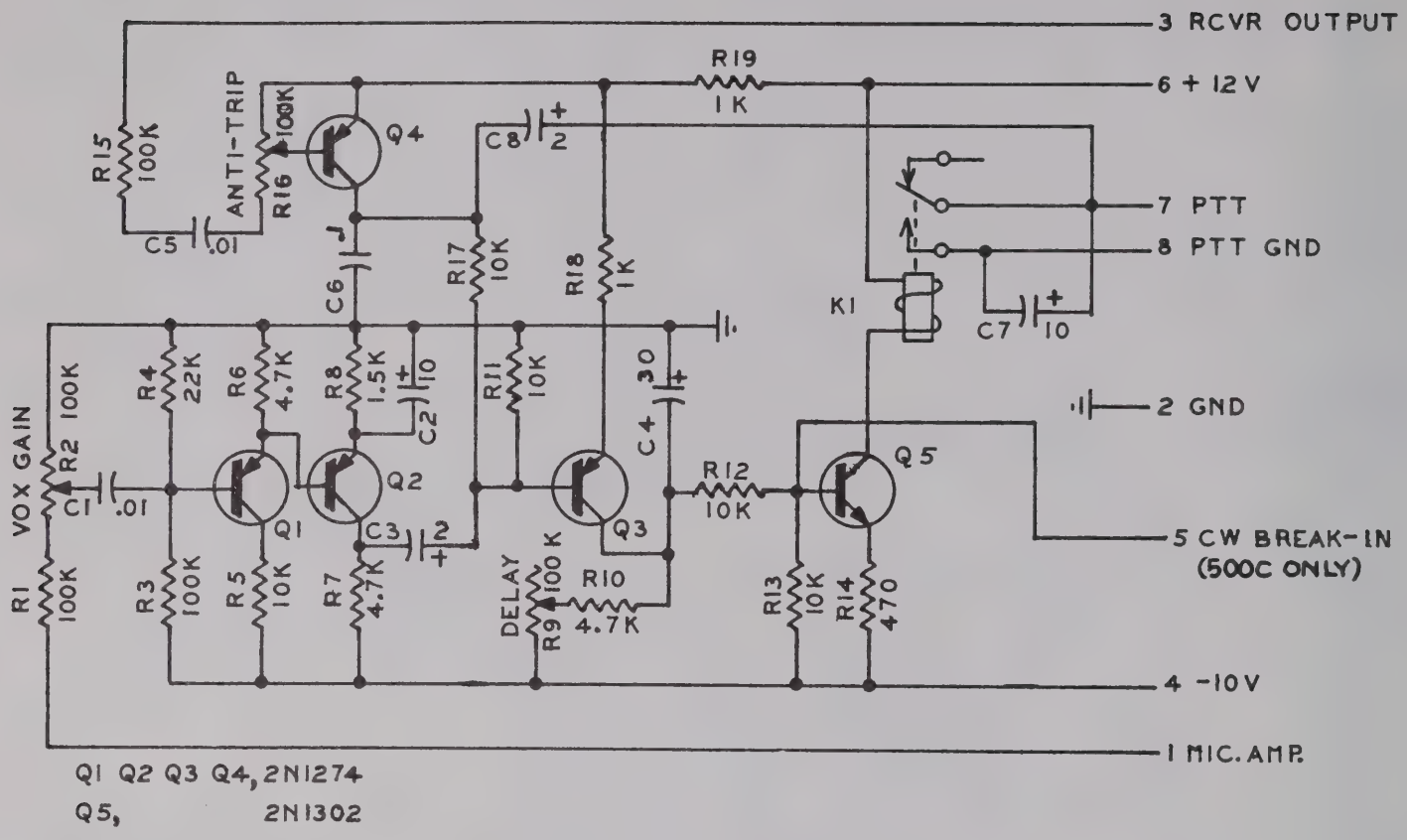


Fig. 8 Swan Voice Control Transmit Accessory

PLUG IN VOX ACCESSORY, MODEL VX-2

OPERATING INSTRUCTIONS

1. Plug in the VX-2 and rotate the VOX GAIN, ANTI-VOX, and DELAY controls fully counter-clockwise. Attach the top of VX-2 to the 250C back with a 6-32 screw.
2. Rotate the Transceiver MIC. GAIN fully counter-clockwise. This will prevent audio from being transmitted but will not affect VX-2 during initial adjustments.
3. While speaking into the microphone in a normal manner, slowly rotate the VOX GAIN control clockwise until the VX-2 keys the transmitter. Do not use more VOX GAIN than necessary to assure positive operation at normal voice levels.
4. Increase the receiver gain until received signals are at a normal volume level. These signals will trip the VOX when picked up by the microphone.
5. With the microphone held in the normal operating position, very slowly increase the ANTI-VOX until received signals do not trip the VOX.

   NOTE: Excessive ANTI-VOX gain will cause received signals to gate the VX-2 off so that no amount of sound at the microphone will key the transmitter. Satisfactory balance between the VOX GAIN and ANTI-VOX is easily obtained when the microphone is at least a foot from the speaker.
6. Adjust the DELAY control to hold the transmitter keyed for the desired interval after you stop talking.

   NOTE: A little experimenting on the air will reveal that only a small portion of the first spoken syllable is lost when the VX-2 is actuated. Short DELAY settings will result in most efficient operation.

SWAN MODEL 210 FREQUENCY CONTROL UNIT

OPERATION

Model 210 Frequency Control Unit is designed for full coverage of the 50-54 mc band when used with the model 250C transceiver. The unit matches the 250C in height, depth, and styling. Relay switching is built-in, and a selector knob on the front panel provides for selection of frequency control. In position 1 the VFO in the 250C is used for both transmit and receive. In position 2 the 250C VFO is used for transmit and the external 210 VFO is used to receive. In position 3 the 210 VFO is used for both transmit and receive.

The 210 plugs directly into the accessory socket on the back of the 250C after the jumper plug has been removed.

CIRCUIT THEORY

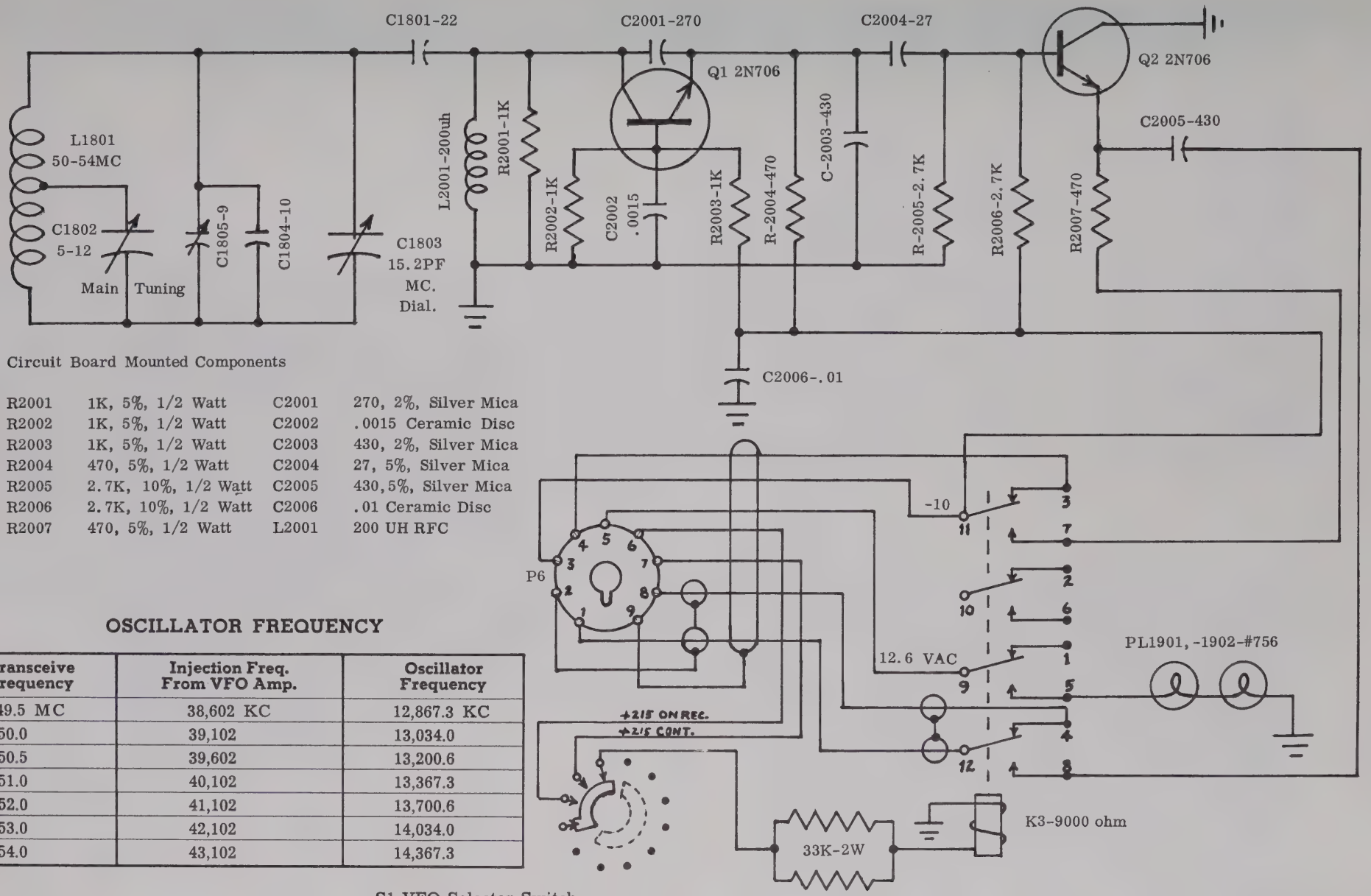
Q1, the 2N706 Oscillator operates in the common base configuration, as a Colpitts oscillator. See Figure 8 Capacitors C1801, C2001, and C2003 effectively tap the oscillator across only about 10 percent of the tank circuit. This results in exceptional stability. Q2, the Emitter Follower, is used for matching the impedance of the coaxial cable to the transceiver, as well as for isolation. The KC tuning dial provides vernier tuning over a 0 to 500 KC range, and the MC dial is adjusted to cover the desired range.

ALIGNMENT

1. Set C1802, the megacycle dial, to maximum capacity. Determine this by moving a signal on the kilocycle dial as far up the 0-500 dial scale as possible. In other words, as the MC dial is turned toward greater capacity, it will cause a given signal to move upward on the 0-500 scale. Rock the MC dial back and forth, until it is determined that maximum capacity has been reached. The index line on the MC dial will be quite close to the 50 MC panel index at this time.

   NOTE: The MC dial is purposely made to turn quite hard, since it will not be moved very often and will not want to be bumped out of adjustment. Tension may be relieved, or tightened further, by means of the No. 6 allen screw set in the aluminum bearing block located between the panel and the MC knob.

2. After the MC dial has been set to maximum capacity, tune for the 50 MC calibrator signal on the 0-500 kc dial. It should come in at zero on this dial. Adjust the VFO trimmer, C1805, so it does.



Circuit Board Mounted Components

R2001	1K, 5%, 1/2 Watt	C2001	270, 2%, Silver Mica
R2002	1K, 5%, 1/2 Watt	C2002	.0015 Ceramic Disc
R2003	1K, 5%, 1/2 Watt	C2003	430, 2%, Silver Mica
R2004	470, 5%, 1/2 Watt	C2004	27, 5%, Silver Mica
R2005	2.7K, 10%, 1/2 Watt	C2005	430, 5%, Silver Mica
R2006	2.7K, 10%, 1/2 Watt	C2006	.01 Ceramic Disc
R2007	470, 5%, 1/2 Watt	L2001	200 UH RFC

OSCILLATOR FREQUENCY

Transceive Frequency	Injection Freq. From VFO Amp.	Oscillator Frequency
49.5 MC	38,602 KC	12,867.3 KC
50.0	39,102	13,034.0
50.5	39,602	13,200.6
51.0	40,102	13,367.3
52.0	41,102	13,700.6
53.0	42,102	14,034.0
54.0	43,102	14,367.3

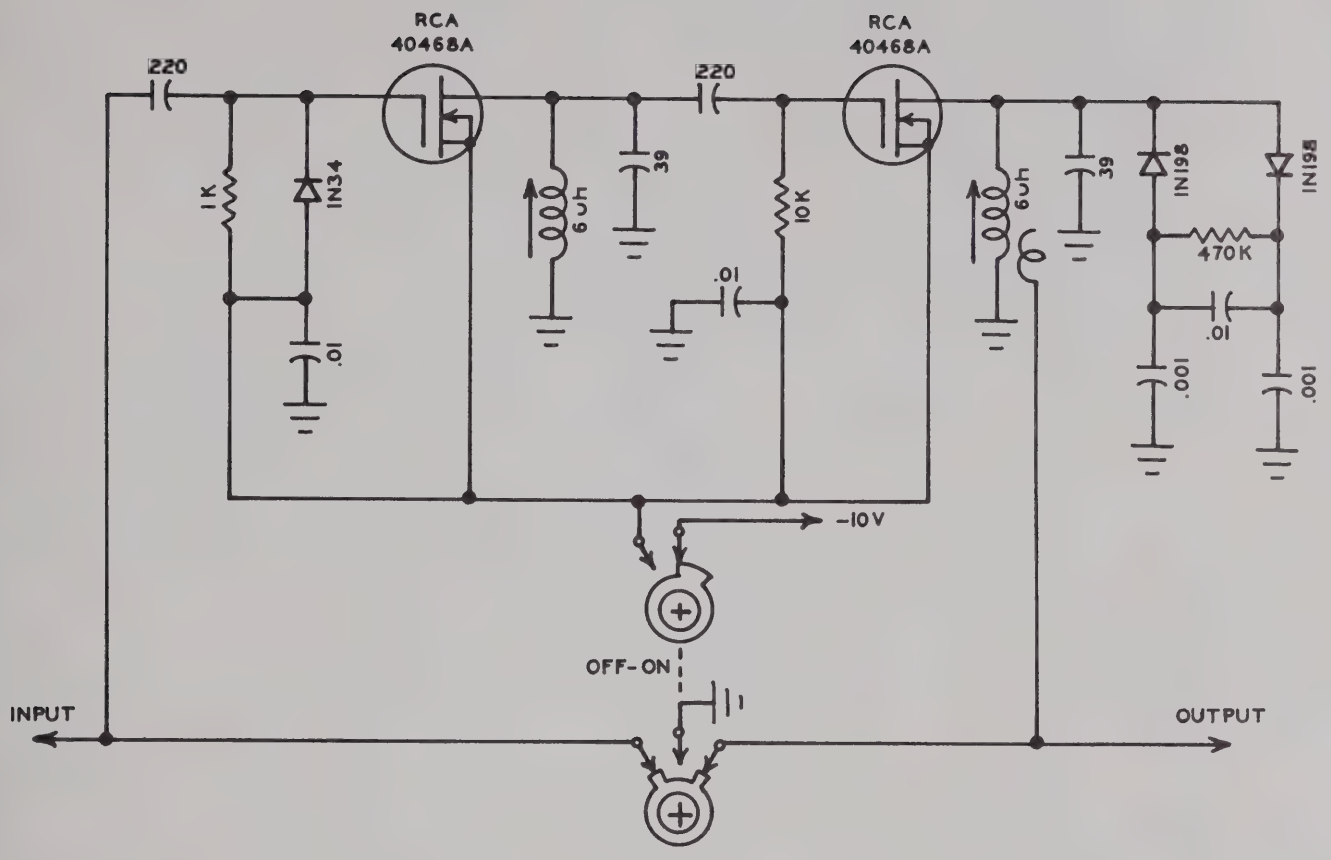
S1-VFO Selector Switch

Pos. 1 — Transceive on 250C VFO.

Pos. 2 — Transmit on 250C VFO, Receive on 210.

Pos. 3 — Transceive on 210 VFO.

Fig. 9 Model 210 Variable Frequency Oscillator

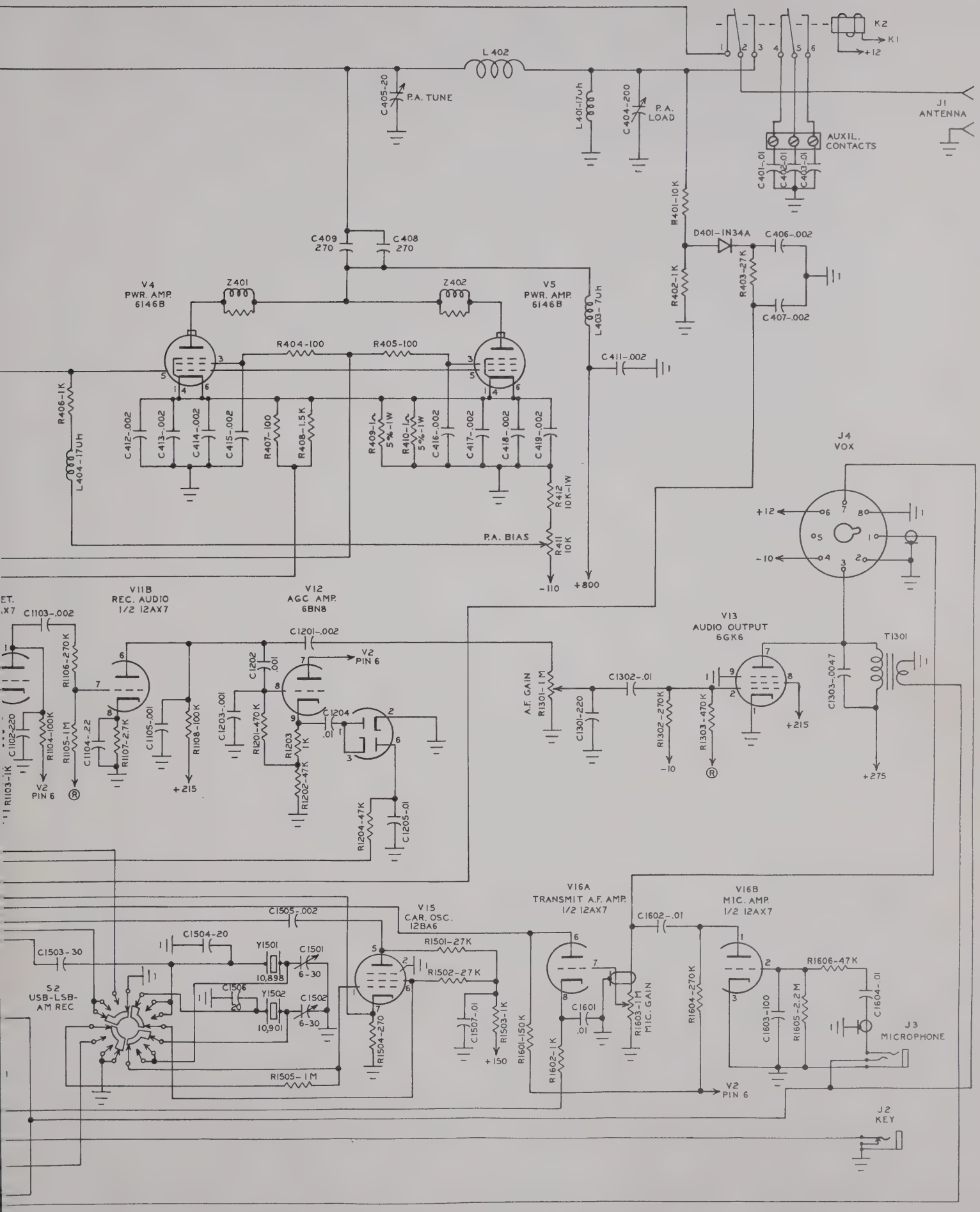


NOISE SILENCER NS-1 INSTALLATION INSTRUCTIONS

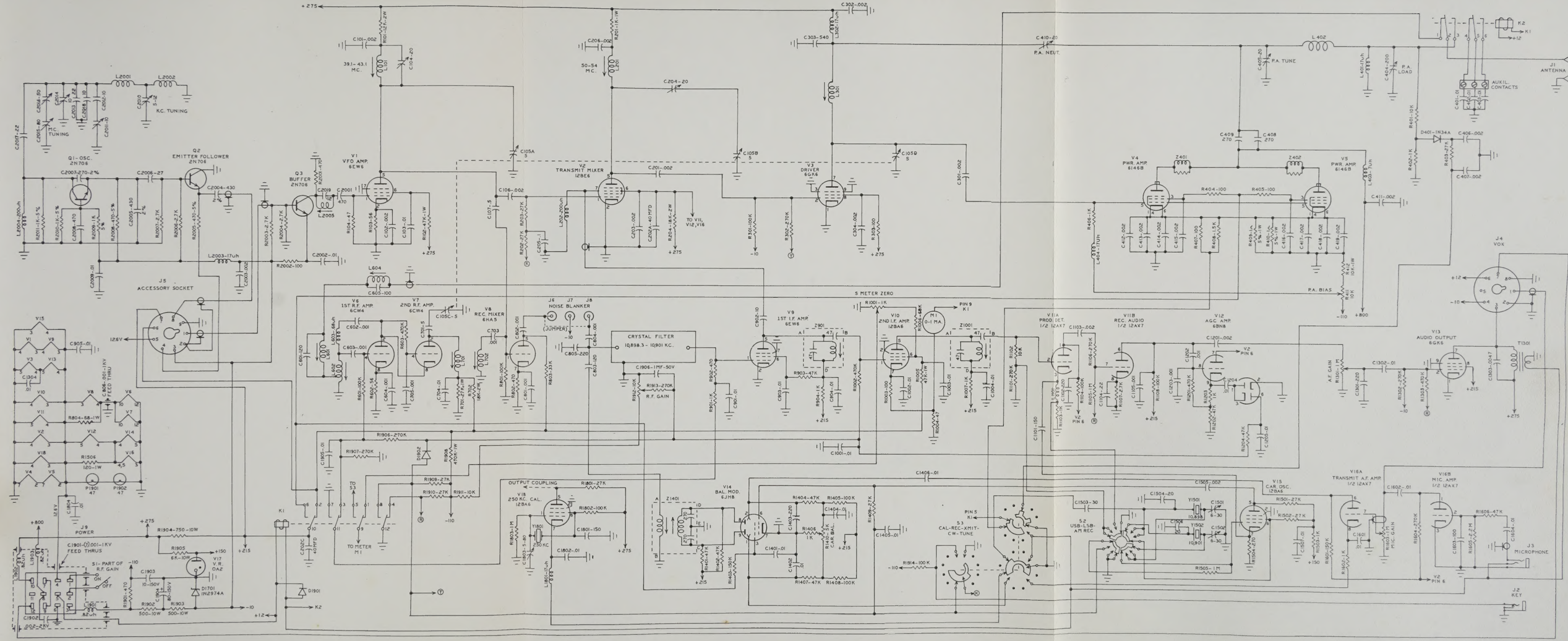
1. Remove the cover from the silencer. Remove the knob and hex nut allowing the PC Board and switch assembly to be removed from the chassis. Remove the #8 black screw from the front left side of the 250-C cabinet. The silencer chassis may now be mounted at the front left side of the 250-C using the #8 screw through the lower hole on the side of the silencer chassis and the original hole on the side of the 250-C. A #6 screw is supplied to secure the top of the silencer to the 250-C using a hole in the cabinet perferation. The board and switch assembly may now be reassembled and the cover and knob replaced.
2. The "OUT" coax from the silencer connects to the "OUT" socket on the back of the 250-C. The "IN" coax from the silencer connects to the "IN" socket on the 250-C. The small "-10" volt line connects to the "-10" socket between the "IN" and "OUT" sockets.
3. Remove the bottom cover of the 250-C and remove the jumper wire between the "IN" and "OUT" sockets. Replace the bottom cover.

OPERATION:

1. With the NS-1 switch in the ON position, most impulse and power leak noise will be removed. In the OFF position the NS-1 is bypassed returning the 250-C to normal operation.



C SINGLE SIDEBAND TRANSCEIVER



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SCHEMATIC DIAGRAM - SWAN MODEL 250C SINGLE SIDEBAND TRANSCEIVER

WARRANTY POLICY

SWAN ELECTRONICS CORPORATION WARRANTS THIS EQUIPMENT AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP, EXCEPT FOR TUBES, TRANSISTORS, AND DIODES, UNDER NORMAL SERVICE FOR A PERIOD OF ONE YEAR FROM DATE OF ORIGINAL PURCHASE. TUBES, TRANSISTORS, AND DIODES ARE COVERED UNDER THE WARRANTY POLICY FOR A PERIOD OF 90 DAYS. THIS WARRANTY IS VALID ONLY IF THE ENCLOSED CARD IS PROPERLY FILLED IN AND MAILED TO THE FACTORY WITHIN TEN DAYS OF DATE OF PURCHASE. DO NOT SHIP TO THE FACTORY WITHOUT PRIOR AUTHORIZATION. THIS WARRANTY IS LIMITED TO REPAIRING OR REPLACING ONLY THE DEFECTIVE PARTS, AND IS NOT VALID IF THE EQUIPMENT HAS BEEN TAMPERED WITH, MISUSED OR DAMAGED.